INTRODUCTION TO IT SYSTEMS

with Lab Manual

Prashant Joshi

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FOREWORD

Engineering has played a very significant role in the progress and expansion of mankind and society for centuries. Engineering ideas that originated in the Indian subcontinent have had a thoughtful impact on the world.

All India Council for Technical Education (AICTE) had always been at the forefront of assisting Technical students in every possible manner since its inception in 1987. The goal of AICTE has been to promote quality Technical Education and thereby take the industry to a greater heights and ultimately turn our dear motherland India into a Modern Developed Nation. It will not be inept to mention here that Engineers are the backbone of the modern society - better the engineers, better the industry, and better the industry, better the country.

NEP 2020 envisages education in regional languages to all, thereby ensuring that each and every student becomes capable and competent enough and is in a position to contribute towards the national growth and development.

One of the spheres where AICTE had been relentlessly working from last few years was to provide high-quality moderately priced books of International standard prepared in various regional languages to all it's Engineering students. These books are not only prepared keeping in mind it's easy language, real life examples, rich contents and but also the industry needs in this everyday changing world. These books are as per AICTE Model Curriculum of Engineering & Technology – 2018.

Eminent Professors from all over India with great knowledge and experience have written these books for the benefit of academic fraternity. AICTE is confident that these books with their rich contents will help technical students master the subjects with greater ease and quality.

AICTE appreciates the hard work of the original authors, coordinators and the translators for their endeavour in making these Engineering subjects more lucid.

(**Anil D. Sahasrabudhe**)

ACKNOWLEDGEMENT

The author is grateful to AICTE for their meticulous planning and execution to publish the technical book for Diploma students.

I sincerely acknowledge the valuable contributions of the reviewer of the book Prof. Kotak Paresh, for making it students' friendly and giving a better shape in an artistic manner.

This book is an outcome of various suggestions of AICTE members, experts and authors who shared their opinion and thoughts to further develop the engineering education in our country.

It is also with great honour that I state that this book is aligned to the AICTE Model Curriculum and in line with the guidelines of National Education Policy (NEP) -2020. Towards promoting education in regional languages, this book is being translated in scheduled Indian regional languages.

Acknowledgements are due to the contributors and different workers in this field whose published books, review articles, papers, photographs, footnotes, references and other valuable information enriched us at the time of writing the book.

Finally, I like to express my sincere thanks to the publishing house, M/s. Khanna Book Publishing Company Private Limited, New Delhi, whose entire team was always ready to cooperate on all the aspects of publishing to make it a wonderful experience.

Prashant Joshi

PREFACE

There is no exaggeration if the development of information technology is considered a great achievement of the 20th century. The impact of technology on human life can be easily seen. In information technology, computer systems are used to create, store, collect, or share electronic data or information. The basic knowledge of hardware, software required in these processes is essential for the users of this technology so that they can make proper use of this technology. Keeping this objective in mind, the subject "Introduction to Information Technology Systems" has been kept in the AICTE's Model Curriculum for first year diploma course.

The first unit describes the various hardware components used in computer systems such as CPU, memory types, displays and peripheral devices. The internet technology is useful in exchanging information or services between remote computers. Overview of internet technology has been included in the first unit. Further, the web browser which is an application software required to use the popular WWW service of the Internet is described in detail. In this unit readers will also be aware of the extensive list of Digital India portals classified under Digital India Mission.

The second unit covers the most important system software of the computer system i.e., operating system. In this unit learner will understand the step-by-step process of installing operating systems. Learners will be versed to install Microsoft Windows 10 Operating System and Linux OS variant UBUNTU 20.04. In this unit, the structure of Linux OS, as well as the features, types, and various important commands of Linux shells, have been explained with examples. At the end of the unit, vi editor, the most popular text editor of unix system, its modes and commands are presented.

In the third unit, the computer languages used in the creation and development of WWW i.e., HTML and CSS has been included. In this unit, various tags and attributes of HTML have been explained. The unit also elaborates how to use CSS to present the content of webpages in an attractive and stylish way.

The fourth Unit deals with the study of Apache Open Office, a tool capable of performing office suite tasks i.e., word processing, calculations, and presentation tasks. In this, the processing and presentation of information has been taught through three important components of Apache Open Office i.e., writer, calc and impress.

In this digital era our information is kept in digital form. To keep these information assets safe, security is required at various levels. What precautions and rules should we adopt in our daily digital life so that we can provide information security, are discussed in the last unit. Two activities are also included for the perpetual learning of the titled unit.

Practical work is always necessary to deeply understand the theoretical knowledge and to make it permanent. The experiments described in the AICTE Model Curriculum have been included at the end of every unit. In addition to objective and subjective exercises, the exercise section is also enriched with online quizzes and crosswords.

The author believes that although full care has been taken in the writing of the content, some errors are possible in it and the content can be improved further. Due to limited knowledge and time of the author, this creation is only an attempt, which can be improved further with your suggestions. If you have any suggestion or notice any error in the book that is not included in the errata list displayed on **https://www.epragya.in/aict-book-itsystems/errata_itsystems** then you should write the same to email address: *joshi.prashant@gov.in* or to publisher, so that the next version can be refined.

Prashant Joshi

OUTCOME BASED EDUCATION

The outcome-based curriculum has been developed for the implementation of an outcome-based education for diploma engineering students. It incorporates the outcome-based assessment also through which educators and evaluators will be able to assess and evaluate the achievement of students in the form of standard, specific and measurable program outcomes. Outcome-based education emphasizes achieving program-specific skills systematically and gradually which diploma engineering students must acquire. Through outcome-based education, learners will be able to commit to achieving a minimum standard without quitting the program at any level. Upon completion of the specific program with an outcome-based education strategy, diploma engineering students will be able to arrive at the following program outcomes:

1. **Basic and Discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis**: Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design/ development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering Tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.
6. **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.
7. **Life-long learning**: Ability to analyse individual needs and engage in updating in the context of technological changes.

COURSE OUTCOMES

After Completing the course, learner will be able to:
CO1: use computer system, browse government portals and use search engines efficiently.
CO2: connect other external hardware devices to personal computer and install driver software.
CO3: install different operating systems in the personal computer (Linux and MS Windows)
CO4: execute shell commands in Unix systems.
CO5: create stylish webpages with HTML4 and CSS.
CO6: work on basic office suit programs e.g., word processing, spreadsheets & presentations.
CO7: to protect their information on personal computer systems & web.

Mapping of Course Outcomes with Programme Outcomes

Course Outcome	Expected Mapping with Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*						
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7
CO-1	2	1	1	2	2	1	3
CO-2	3	2	3	2	1	1	3
CO-3	2	1	2	1	1	1	3
CO-4	2	2	1	2	1	1	2
CO-5	3	2	2	2	2	1	3
CO-6	3	3	3	3	1	2	3
CO-7	3	3	2	2	3	1	2

LIST OF ABBREVIATIONS

Abbreviation	Full Form	Abbreviation	Full Form
3G/4G	Third Generation/Fourth Generation	MODEM	Modulator/Demodulator
AI	Artificial Intelligence	MOOCS	Massive Open Online Courses
ALU	Arithmetic and Logic Unit	MPLS	Multiprotocol Label Switching
ATM	Automated Teller Machine	NFC	Near Field Communications
CD	Compact Disc	NVM	Nonvolatile Memory
CRT	Cathode Ray Tube	OLED	Organic Light Emitting Diode
DHCP	Dynamic Host Configuration Protocol	OS	Operating System
DLP	Digital Light Processing	PIN	Personal Identification Number
DNS	Domain Name System	POTS	Plain Old Telephone System
DRAM	Dynamic Randon Access Memory	QR Code	Quick Response Code
DVD	Digital Versatile Disc	RAM	Random Access Memory
ESD	Electrostatic Discharge	ROM	Read Only Memory
FOSS	Free and Open Source Software	SERP	Search Engine Result Pages
FTP	File Transfer Protocol	SMS	Short Message Service
GIS	Geospatial Information Systems	SMTP	Simple Mail Transfer Protocol
GOI	Government of India	SRAM	Static Random Access Memory
GPRS	General Packet Radio Service	SSL	Secure Socket Layer
GPS	Global Positioning System	TFT	Thin-Film Transistor
GUI	Graphical User Interface	UPI	Unified Payments Interface
HTTP	Hypertext Transfer Protocol	URI	Uniform Resource Indicator
HTTPS	Hypertext Transfer Protocol Secure	URL	Uniform Resource Locator
ICT	Information Communication Technology	USB	Universal Serial Bus
IOT	Internet of Things	VoIP	Voice over the Internet Protocol
ISP	Internet Service Provider	VPN	Virtual Private Network
LAN	Local Area Network	WYSIWYG	What You See Is What You Get
LCD	Liquid Crystal Display	WWW	World Wide Web
LED	Light Emitting Diode	XML	Extensible Markup Language
LTS	Long Term Support		
MAC	Media Access Control		
MFA	Multi Factor Authentication		
MIS	Management Information System		
ML	Machine Learning		

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GUIDELINES FOR TEACHERS

To implement Outcome Based Education (OBE) knowledge level and skill set of the students should be enhanced. Teachers should take a major responsibility for the proper implementation of OBE. Some of the responsibilities (not limited to) for the teachers in OBE system may be as follows:

- Within reasonable constraint, they should manoeuvre time to the best advantage of all students.
- They should assess the students only upon certain defined criterion without considering any other potential ineligibility to discriminate them.
- They should try to grow the learning abilities of the students to a certain level before they leave the institute.
- They should try to ensure that all the students are equipped with the quality knowledge as well as competence after they finish their education.
- They should always encourage the students to develop their ultimate performance capabilities.
- They should facilitate and encourage team work to consolidate newer approach.
- They should follow Blooms taxonomy in every part of the assessment.

Bloom's Taxonomy

Level	Teacher should check	Student should be able to	Possible mode of assessment
Creating	Students ability to create	Design or Create	Mini project
Evaluating	Students ability to justify	Argue or Defend	Assignment
Analysing	Students ability to distinguish	Differentiate or Distinguish	Project/Lab Methodology
Applying	Students ability to use information	Operate or Demonstrate	Technical Presentation/ Demonstration
Understanding	Students ability to explain the ideas	Explain or Classify	Presentation/Seminar
Remembering	Students ability to recall (or remember)	Define or Recall	Quiz

GUIDELINES FOR STUDENTS

Students should take equal responsibility for implementing the OBE. Some of the responsibilities (not limited to) for the students in OBE system are as follows:

- Students should be well aware of each Unit Outcome (UO) before the start of a unit in each and every course.
- Students should be well aware of each Course Outcome (CO) before the start of the course.
- Students should be well aware of each Programme Outcome (PO) before the start of the programme.
- Students should think critically and reasonably with proper reflection and action.
- Learning should be connected and integrated with practical and real-life consequences.
- Students should be well aware of their competency at every level of OBE.
- The content included in the chapters has been kept as concise as possible. For detailed study, use QR code resources or references and suggested readings given at the end of the units.
- Unit wise solutions can be obtained from URL: *https://www.epragya.in/aicte-book-it-systems*

CONTENTS

1 Internet Skills and Computer Basics

UNIT SPECIFICS

This unit specifies basics of internet and computer, introduction to browser and its constituent parts. Interface of a typical browser and its features are also discussed in detail. The search engines with its few examples are also discussed with a table of operators to find writing efficient search queries. It aware the student about various pillars, vision of digital India and portals. It also specifies the architecture and component of computer e.g., central processing unit, control unit, memories, different computer peripherals like keyboard, mouse, printer etc. Rationally this unit gives fundamental knowledge about computer, internet and various digital India initiatives.

RATIONALE

Usage of computers and the internet has become very important in our daily life and it is increasing day by day. The proliferation of basic computing can be observed in paying daily utility bills (water, electricity, broadband, mobile recharge, etc.) or booking for travel (car, bus, rail, or airplane) or apply for government services, etc., Now, online medium is available for almost all the works. Such online availability of services not only saves labor, money and time but also helps in making services universally accessible in a time-bound, transparent manner. For accessing online services, we need to have basic knowledge of computer hardware, software and the Internet. In this unit we will learn about basic hardware components of computer systems, a web browser (a software application to access the internet), tricks to retrieve precise information from the internet and some important web portals of national, state importance.

PRE-REQUISITES

- Basic understanding of the usage of computer technology.
- Keen to learn computer basics.

UNIT OUTCOMES

Learners will be able to:

U1-O1: Identify & connect different peripheral devices (printers, scanners, etc.) to a computer.

U1-O2: Use different types of browsers and their key features (bookmarking, private browsing, tabbed browsing & synchronization, etc.)

U1-O3: Write efficient search queries for precise information retrieval from the web.

U1-O4: Browse various digital India portals, state portals & college portals and analyze various available services.

Table 1.1: Mapping of Unit Outcomes with the Course Outcomes

Unit-1 Outcome	EXPECTED MAPPING WITH COURSE OUTCOMES *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*						
	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
U1-O1	3	3	1	1	2	1	1
U1-O2	2	1	1	1	3	1	1
U1-O3	2	1	1	1	3	1	1
U1-O4	1	1	1	1	1	1	1

1.1 BASIC INTERNET SKILLS

Internet is a popular tool for accessing digital information & services across the globe. It uses digital devices like computers, mobiles, other gadgets and network devices to exchange information and services. Skills required to access various applications of the internet are commonly termed as "Internet Skills". These skills are very important nowadays and we will learn, some basic terms pertaining to the internet, how to access with web browsers and use of search engines to find relevant, reliable & precise information (like pearls) from the web (the information ocean).

1.1.1 What is the Internet?

Internet is nothing but a collection of various interconnected networks of heterogenous types across the globe. It is comprising of different kinds of devices, specifications for hardware & software to be connected in a global network and a variety of protocols with a common understanding between various countries, universities, companies and global agencies. It is also referred as a "network of networks". The purpose is to share resources over a global network, a resource can be a simple webpage having information, a network printer, or any digitally accessible service like email, e-commerce, real-time streaming, telnet, etc. It is a global network working over physical cables like traditional POTS (plain old telephone system), TV cables, fiber optic cables and even wireless mediums like Wi-Fi, 3G/4G or satellites communication depending on need and type of communication.

1.1.2 Common Applications of the Internet

Internet is being used in a variety of applications, few of them are as under:

1. **Communication:** Millions of E-mails are sent and received worldwide in a day for exchanging information. Online messengers are also popular for real-time communications. With help of VoIP (Voice over the internet protocol) audio and video conversation also take place.
2. **E-Commerce:** The Internet provides an online market to sell/purchase various products and services globally. Now, we can purchase things from our neighbouring house to the farthest country as well. These online stores may work round the clock and enable consumers to purchase from home.
3. **Storage & File Transfer:** The user can send and store files of different types. Cloud computing makes it possible to share it among various users with their associated roles to access such files.
4. **Live streaming & podcasts:** Users can send their live videos and audios to large groups of people in a real-time manner.

5. **News, Entertainment:** Whatever is happening in the real world, it can be updated as a piece of information on the web. Now, it is possible to provide breaking news, entertainment, election results or about the sports activity of your favourite team or sportsperson.
6. **Collaborative tasks:** People can meet online, discuss things and work together using collaborative applications.
7. **Research & learning activities:** With the availability of information and online resources, researcher and learners can continually equip themselves.
8. **Interactive gaming:** We can play & interact online with another human being, a computer program having a real-time conversation. We can participate in the game across the world.
9. **Social Networking:** Various online platform provides facility to connect the people of the same interest. Millions of people daily connect with their colleagues, family members and find new persons on such platforms.
10. **Job hunting:** Job providers can post various vacancies on the internet via their portal, third-party portals or social media. Jobseekers search for various jobs on portals, newspapers & apply their applications with resume to concerning human resource managers.
11. **Navigation & Tracking:** Searching best routes on digital maps, tracking the live status of trains, cars, parcels are few widely used location-based services of the internet.

In addition to the above, real-time updates, cashless transactions, online booking, live trading and advertisements, etc. are also some popular uses of the internet.

1.1.3 Glossary for the Internet Basics

Few commonly used terms for the internet basics are:

WWW: World Wide Web or simply 'web' is the most popular use case of the internet. It is an information system where different kinds of files or resources are hosted and uniquely accessed via URL address. These resources are interlinked with hyperlinks. The resources can be uploaded or downloaded with application software known as web browser using some standard protocols like HTTP or FTP.

Domain Name: It is a human understandable unique name on the internet to identify a computer system or resource.

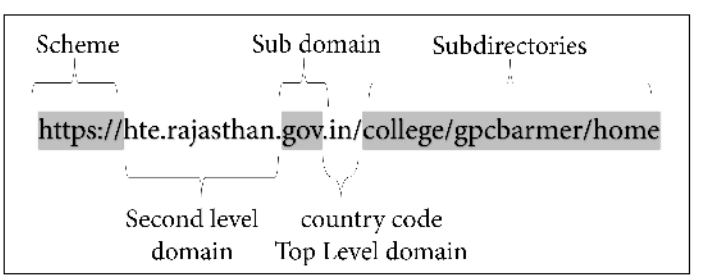


Fig. 1.1: Structure of a URL

URL: Uniform Resource Locator is known as the web address. It is a unique identifier of a web resource with a specification of how to access and from where to access it. The structure of URL is shown in Fig.1.1

HTTP: Hypertext Transfer Protocol is a set of rules (protocol) that define the way how data transfer over the web. It is used to access websites.

HTTPS: It is the secure version of HTTP using SSL (secure socket layer) encryption.

FTP: File Transfer Protocol is a set of rules (protocol) that define the way how data transfer over the internet. It is used to transfer a large file from one host to another.

Hyperlink: It is a word, phrase or image that refers to another data. can be followed by the user by clicking or tapping. The reference may belong to another document or specific element of the same document.

Browser: It is an application program with a user interface to display and navigate webpages over WWW.

Webpage: It is a hypertext document designed to view on the web browser.

Website: It is a collection of web pages and related resources that is identified by a common domain name and hosted (published) on a web server.

Search Engine: It is a web-based complex software that provides information searching services to its users. The search engine uses various algorithms to search its huge database and produce appropriate search results taking minimal time.

ISP: An Internet Service Provider is a company that provides internet access to other companies or individuals.

Email: Electronic Mail is a method of exchanging digital messages from one electronic device to another device or to many recipients via a network.

Podcast: It is a web resource available on the internet that contains audio information.

Filetype: Every information available on the internet have a certain format and type which is understood by their file type. Information can be in form of documents, audio, video, etc.

Download: It is the process of copying data over the internet from one device to another in direction of a server to a client machine.

Upload: It is also the process of transferring data from one device to another on the internet but from client to server-side.

DNS: The domain name system translates human understandable domain name (for example, www.ncs.gov.in) to machine readable IP address (for example, 203.129.202.69)

TCP/IP: Transmission Control Protocol and Internet Protocol are set of rules that govern the linking of a computer system to the internet and similar computer networks.

Modem: It is the short name for hardware device modulator-demodulator. It is responsible to convert the digital data of a computer system to an analog signal which can travel over telephone lines (modulator) and vice-versa.

Network equipment: These are networking hardware required for the interconnection and communication in a computer network e.g., bridge, repeater, hub, switch, router, modem, etc.

Cloud Computing: It provides computer resources over the internet as per the demand of the user. Resources can be computer infrastructure, computing power or data storage, etc.

TYPE: A Webpage **Title:** Internet Basics

1.2 UNDERSTANDING A BROWSER

Services & information provided by the internet follows the *client-server model*. In this model when a client machine seeks some service, it forms a request message (HTTP Request) and sends it via a

client-side program to network towards the server machine. On the other side, when a request approaches the server machine it grants or denies the requested service in form of the response message (HTTP Response). A browser is a client-side application program to search and retrieve information from the world wide web, available in the form of web pages and display it on the client's machine. It is also termed as "web browser" or "user agent". Process of sending and receiving message is shown in Fig.1.2. In the coming section, we will understand some trending variants of the browser, their comparison in terms of offered features and the basic architecture of a web browser for its better understanding.

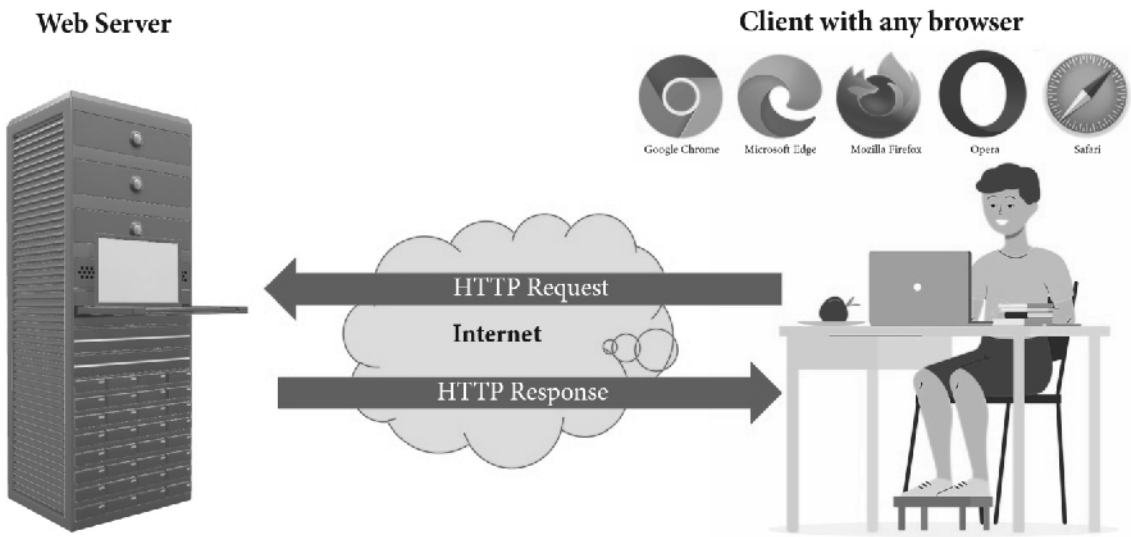


Fig.1.2: HTTP Request and Response

Google Chrome: It is the most widely used web browser developed by Google. It is cross-platform web browser that was firstly released in 2008 for the Windows operating system of Microsoft. This browser is now a proprietary freeware based on Google's free and open-source software (FOSS) project "chromium". It is widely used due to its speed & security capabilities. It is constantly updating and keeps us safe from phishing and malware scams. Web store keeps chrome customizable via its various themes, extension and web apps. It can translate a website in different languages.

Microsoft Edge: It is developed by Microsoft and was firstly released in 2015 for its proprietary operating system Windows 10. It is the successor of the internet explorer web browser of the Microsoft family. It is also integrated with Microsoft's online platforms for providing voice control, searching functionality and dynamic content related to searches inside the address bar.

Mozilla Firefox: It is a free and open-source browser developed by Mozilla Foundation and its subsidiary Mozilla corporation. It was initially released in September 2002. In comparison to other browsers, Firefox provides an extensive library of extensions & add-ons to its users for customizing their browser experiences & functionality.

Opera: It is a multi-platform browser developed by Opera software. It was initially released in April 1995. It is also available for mobile devices and these mobile versions are known as opera mini & opera mobile. With its artificial intelligence (AI) based platform opera browser supports a

personalized news feed at the start page. It also supports sharing files, links and notes between user's different devices with the *opera flow* feature.

Safari: This browser was developed by Apple Inc. and it is not a complete open-source browser. It was initially released on January 2003 as a part of MAC operating system. It is considered as faster browser with considerable high privacy features. Safari also implemented feature of cross site tracking. It natively supports web page translation and picture in picture functionality.

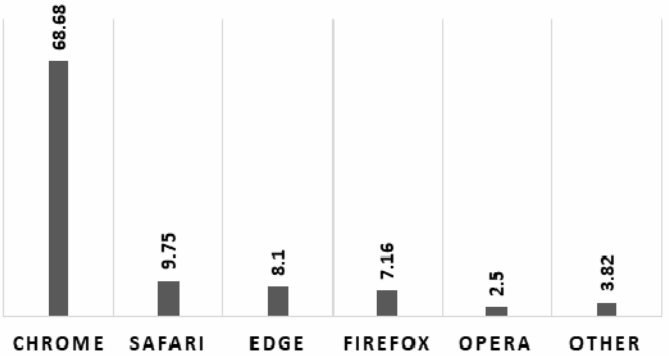


Fig. 1.3: Web Browser Market Share Percentage

Market share of trending web browser (as of June, 2021) is shown in Fig.1.3 (data courtesy: www.gs.statcounter.com)

Interesting Facts

Mosaic web browser which released in early 1993 was first web browser. It was capable to display graphics content in line with text. In spite of showing to separate window.

1.2.1 Elements of a Chrome Browser Window

Every computer has a default web browser software, which one is installed on your system may depend on the machine and operating system you have. We can switch between them or can add other web browsers too. Google chrome browser has the highest market share as of June 2021, we will discuss this variant to demonstrate various parts of a browser window(see Fig. 1.4), although basic features of browsers remain the same in other variants too with some change in terminology.

- To be connected to the internet we have to start or ***launch the web browser*** first. Just click on the icon (picture) available at your desktop home screen or on to bottom bar (taskbar) of your screen, e.g., if we have a chrome browser installed into our system we have to click on the shown icon. As per your installed browser icon may differ.
- To access a website, we have to input its URL or web address into the ***address bar*** of the browser window as shown in step 1, www.childlineindia.org is typed into the address bar for our example.
- When a webpage is loaded it may show the ***title*** of the webpage as shown in step 2.
- A browser window has many controls on it for a better web experience and surfing. Forward button (left arrow control) and backward buttons (left arrow control) are provided to go back

and forth between the web pages. These are shown in steps, 3 and 4. These are combinedly known as ***navigation buttons.***

- A webpage may comprise many parts and sections to present information. If any part is not loaded well then,the ***Refresh button*** is provided to reload the webpage and update the information we are viewing.

Interesting Facts

Chrome web browser's address bar area is utilized for entering URL, search terms, bookmarking, browsing history and site information (paddle lock, security status etc.) thus known as **OmniBox.**

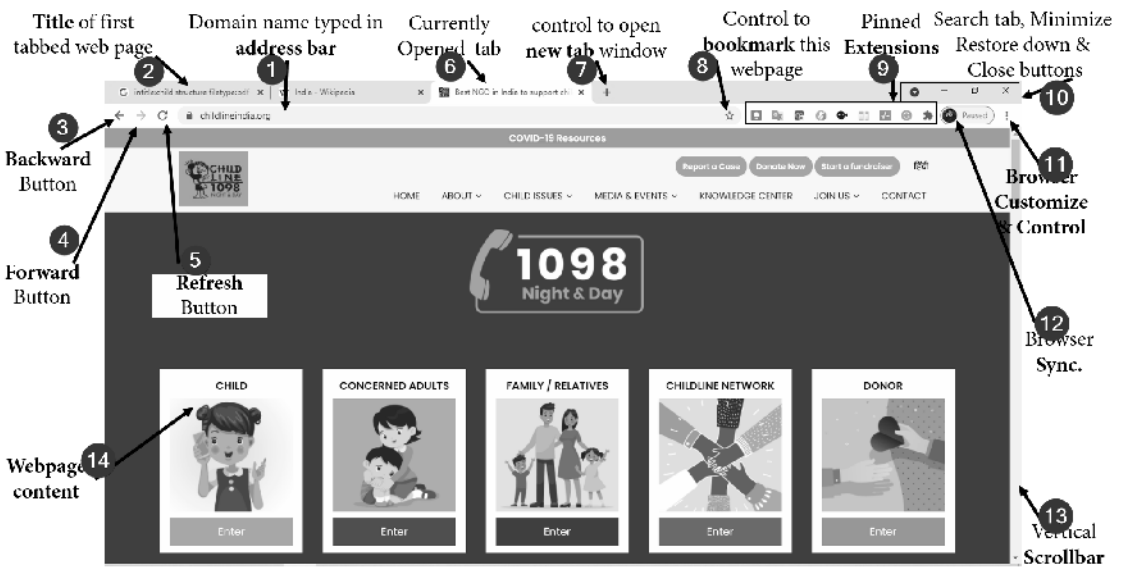


Fig. 1.4: Elements of Chrome Web Browser

- During a website search or surfing, we may click on various hyperlinks to find more related information. Hyperlinks may be opened in the same window or new tab of the browser. Currently opened window is shown by different color and style. Step 6 shows the currently opened window tab.
- If we want to search or browse a new webpage then we may open a ***new tab*** window using the '+' control provided next to the last tab. (It is shown in step 7)
- The browser provides the facility of storing and managing frequently visiting webpages with the facility of bookmarking. So during a new webpage visit, If we want to store the current web address for future reference, we may opt to ***bookmark*** it using the 'star control'. It is located at the rightmost side of the address bar as shown in step 8.
- In addition to the basic functionality of the browser, we may customize it and add additional functionality by installing extensions and add-ons. All such extensions may appear on the browser user interface if they are pinned (marked to be present). Many icons are shown in a rectangle as indicated by step 9 of Fig. 1.4.

- Every chrome browser window has four controls on the right upper corner namely search tabs, minimize, restore down and close as depicted in Fig. 1.5.A click on first control 'search tabs', gives us a list of currently opened tabs and recently closed tabs. ***The search tab*** feature is a powerful tool to search or select (open) a webpage among these tabs. It can be used to search a tab with a given title by inputting text in the search box. Minimize, restore down and close buttons perform the task as their name implies.

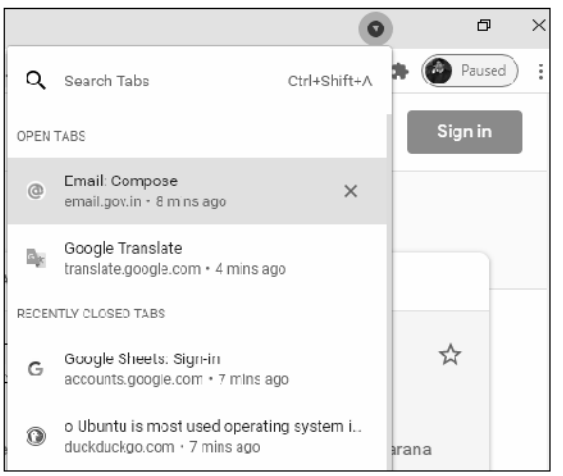


Fig. 1.5: Chrome Search tab

- Chrome browser provides the capability to synchronize different user settings across different machines via its synchronization feature. A user who have stored its bookmarks, passwords, or payment methods or address details may access all such information on a different machine if he/she allows the Sync. The user interface is shown in 1.6(a)
- Chrome browser has ***browser customize and control*** section accessible via an ellipsis ":" (three vertically aligned dots) It shows various options of the chrome browser as shown in Fig. 1.6.(b)

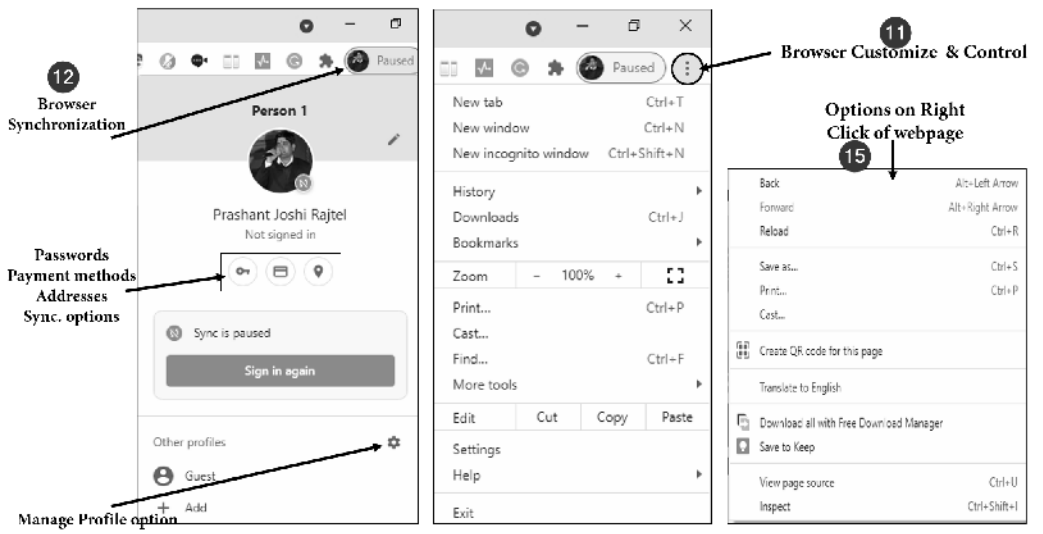


Fig. 1.6: Chrome Window (a) Synchronization (b) Customize & Control (c) Right-click Options

- In addition to the visible user interface, we can access many functionalities via right-clicking on the webpage. The various available command will be shown as depicted in the Fig. 1.6(c)
- with step 15. It depends on the setup of the software environment on your machine. As I have installed some extensions, my window shows some extra features of "create QR code for this page", "save to keep", etc.

TYPE: A Webpage **Title:** Using a web browser

1.2.2 Common Browser Features

1. **Bookmarking**: It is the process of storing URI (Uniform Resource Identifier) for future retrieval. With this feature, users can store and manage web addresses of frequently visiting websites in their browser software. These web addresses can be accessed next time without providing their URI in the address bar. It is termed as *favourites* in the Microsoft Edge browser.
2. **Download management**: This is an inbuilt software tool for browsers that allows the users to manage all the downloaded files. It displays the files in chronological order and gives us the facility to search files by their name. We can also browse the folder where it is actually stored by 'show in folder' or 'open containing folder' option. We can open it by the user interface

   Ellipsis → Downloads or by

   pressing CTRL + J short cut key (works in chrome, MS Edge & Mozilla Firefox)
3. **Password management**: Browsers provide a facility to store usernames and passwords of websites that requires authentication. To protect this confidential information from other users of a computer, the functionality of the master password is incorporated.
4. **Tabbed browsing**: It allows users to browse different websites simultaneously on different tab windows. All these tabs reside in a single web browser window.
5. **Browser history**: Browser can store all webpages visited by its user with associated data like the page title, time of visit, etc. so that user can revisit those webpages if necessary. All such data is stored locally on the browser.
6. **Form management**: This feature of the browser is also known as the auto-complete feature. It enables the user to auto-fill the web form entries of a user from its locally saved browser data.
7. **Spell checking**: This browser feature provides the capability to correct the misspelled words.
8. **Privacy mode**: Browsers introduced this feature to enhance the privacy surfing of its user. It allows users to surf the web without recording browsing history, cookies and form data of the user. Browser accomplishes thisvia the creation of a temporary session that is altogether separate from the main session and user data. It is known as "***InCognito***" in chrome browser and "***inPrivate Browsing***" in Microsoft Edge browser.
9. **Auto update**: This feature shows the ability of a browser for self-updating. Nowadays, almost every browser is capable of auto-updating.
10. **Ad blocking**: It is also termed ad filtering. Browsers having this feature are capable of blocking or altering online advertising. Generally, it is done with help of some browser extension.

11. **Incremental search**: This feature shows the ability of a browser to find matches on a webpage incrementally as search terms are typed in the search box.
12. **Page zooming**: It is the page-level capability of the browser to zoom in or zoom out the web content or images displayed on the webpage.

TYPE: Use of ICT (A Webpage) **Title:** Bookmarks in chrome

1.2.3 Constituent of a Web Browser

A browser is constituted with a user interface, browser engine, rendering engine and other components. The architecture of the common browser is depicted in the Fig.1.7

User Interface: As the name implies this component of the web browser enables the user to interact with visual controls available on the web page. These controls include the address bar, previous and next button, home button and all other controls which are responsible to fetch and present users desired web pages (except the main window where web pages are presented).

Browser Engine: This is a key component of browser architecture. It operates as a bridge between the user interface and the rendering engine. The browser engine is responsible for creating and manipulating the rendering engine as per inputs provided by the user interface.

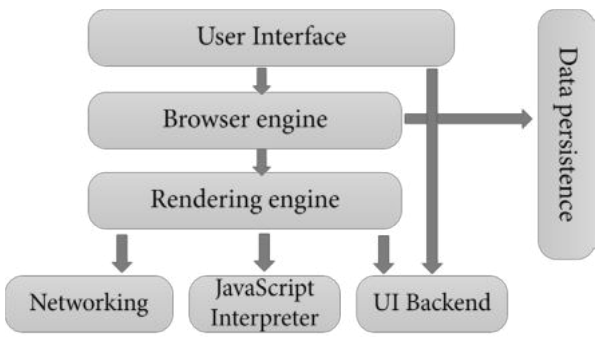


Fig.1.7: Web Browser Architecture

Rendering Engine: The main role of this component is to render a requested web page. For rendering, this engine parses HTML documents and images which are formatted with CSS. After parsing a final layout is generated and presented on the UI of the client machine. Rendering engines natively have the capability to display images and HTML and XML documents but with the addition of browser extension, it can display other types too like pdf. Many standard rendering engines available in the internet community and each browser is comprised of its unique rendering engine. Few popular web browsers and their associated rendering engines are listed below:

- *Blink*: Google Chrome and Opera V.15+ MicrosoftEdge
- *Gecko*: Mozilla Firefox
- *Webkit*: Chrome for IOS and Safari

Networking: This component administers the connection with help of HTTP and FTP protocol. It also concerns the secrecy issues during the network communication.

JS interpreter: Passing and executing JS code is handled by this component.

UI Backend: This component is responsible for drawing widgets like windows and combo boxes. The user interface method of underline OS is utilized for this purpose.

Data storage and persistence: It is a persistent layer saving data like cookies on the client's local hard disk.

1.3 EFFICIENT USE OF SEARCH ENGINES

The Internet contains an enormous amount of data whose content and context change over time. If the Internet is to be called a sea of information, the required information is considered as a pearl, then we will also need some pearl hunters to find such valuable pearls. This information hunting work is done by search engines. Finding precise data is always challenging but undoubtedly search engines made internet surfing convenient and digital life enjoyable. Searching for desired information in minimal time is another important facet of the information retrieval paradigm. Although modern search engines are much powerful than ever before we should know how to utilize their capabilities efficiently for our finding purposes. We should know the way the search engine works, types of searches done by users to retrieve information and some features available on user interfaces of a search engine to efficiently searching the world wide web.

1.3.1 What is a Search Engine?

The search engine is a generic name assigned to a software system whose purpose is to systematically search the web pages against supplied search terms, commonly known as 'keywords', 'search query' or 'search phrase'. The result of this search is presented in form of a listing technically referred to as search engine results pages (SERP). The search engine is not a mere finding tool but a web service that performs the task of indexing, organizing, rating and reviewing websites too. There are many search engines available in the world of computer networking. Every search engine works in its way and that's why we get different search results for the same search query in different search engines. Some rely on users to maintain a catalogue of webpages where other use their automated advanced software to identify key information available in interlinked websites.

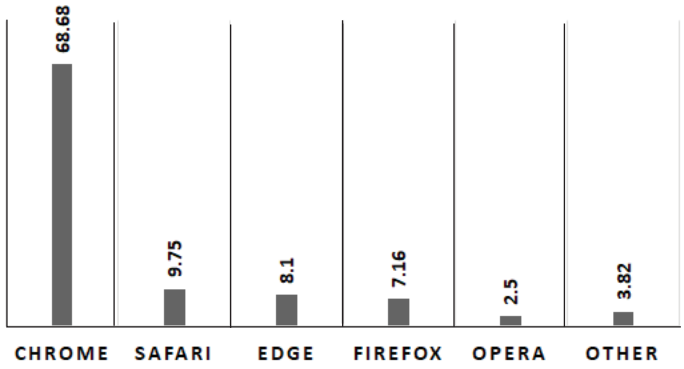


Fig. 1.8: Search Engine Market Share

Some popular search engines with their current market share (June 2021) are depicted in Fig. 1.8 (data courtesy: www.gs.statcounter.com)

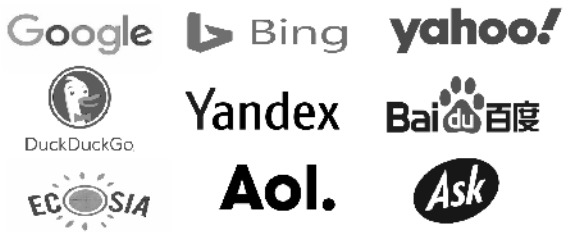


Fig. 1.9: Different Search Engines

1.3.2 Some Popular Search Engine Variants

Different search engines have their unique user interface, features and underlying technology. Some popular search engines are depicted in Fig. 1.9, we will discuss some trending ones.

Google: It is the most trusted search engine worldwide. It was developed by larry page and Sergey brin in 1996 for their academic research project. It was initially known as BackRub. It is written in C, C++ and Python programming languages. It is being used as a default search engine for various web browsers e.g., Chrome, Safari and Mozilla Firefox, etc. Google is using emerging technologies like artificial intelligence (AI), machine learning (ML) to recognize user behaviour, likings and other contextual information and produce better results for its users.

Microsoft Bing: It is owned and being maintained by Microsoft. It is the successor of previous search engines of Microsoft e.g., MSN Search & Windows Live Search. It was launched in June 2009 and written in ASP.NET. It provides a variety of search services like web, Image, video and map. Unlike google its home page provides various links to current news, weather and links to other information like "On this day in history"

Yahoo: This is the oldest search engine available to internet users. It is founded by Jerry Yang and David filo in January 1994 as "Jerry and David's guide to the World Wide Web". This search engine is owned by Yahoo and originally written in general-purpose scripting language- PHP.

Baidu: It is among the top performer in the market share of search engines worldwide. It is owned by Chinese company Baidu, Inc. which is one of the largest artificial intelligence and internet companies in the world. It was incorporated in January 2000 by Robin Li and Eric Xu. This search engine holds more than 72% of the Chinese search engine market as of June 2021. It offers various services like Maps, Image search, Video search, patent search, legal search, games, etc.

Yandex: It is a search engine prevalently used in Russia and was launched in September 1997. It is owned by Yandex N.V., a Russian-Dutch domiciled multinational. Apart from image searching, video searching and web searching, it also provides other services like online text and website translator, maps, email, app analytics and marketing platform.

Duckduckgo: Last in our list of the search engine but not the least, Duckduckgo(ddg) is a favorite search engine for millions of users (mine too), especially who cares their privacy and want to keep their searching history anonymous. It is created by Gabriel Weinberg and owned by Duck Duck Go Inc. It was launched in September 2008 and its code is written in Perl, Java Script and Python. Many search engines record the search history of their users and profile their surfing, searching habits by giving an excuse for better-personalized search results. In contrast, Duckduckgo respects the privacy of its users and displays the same search results to its all users for a given search query. It is against the online tracking of user's data and believes that "Your personal data is nobody's business".

1.3.3 Types of Web Searches

In the case of web information retrieval,the intention or need behind searching query is not always informational in nature. Web search queries are classified into three types according to the intention behind the search.

1. **Navigational**: Users may input some search keywords not for seeking direct information about the entered text, in spite they intent to navigate to some website. The purpose is to navigate a website that is in the mind of the user or he/she think that such website should be there or they have visited the website in past. e.g. users may simply type "jimcorbett national park" with intention (not known to search engine) to navigate the official website. The search result will show different search results having beautiful pictures of the national park, weblinks to 'Top Stories' and videos of the national park and many other related results. Here, by examining the website domain name, a user may navigate to any of the above websites:*https://uttarakhandtourism.gov.in/* or *https://www.corbettonline.uk.gov.in/*
2. **Informational**: In such web queries user's intention is to find related information about the given search term which may be on some interlinked static webpages.The purpose is to read those pages to acquire facts about the input text. e.g. if a user has entered the search term "jimcorbett national park" with an intention to find its history, geography or climate then the user may open any suitable results available infront of him like Wikipedia pages or another website.
3. **Transactional**: The purpose of such web queries to reach a website where further interaction or web-mediated activity is performed. e.g. if the user enters search term "jimcorbett national park booking" then out of available search result user will select suitable web result to navigate a website where he will perform booking operation for his intended visit to the national park. User may visit *https://www.corbettonline.uk.gov.in/* and finalize a visit via booking.

Such web queries are also performed widely for shopping, downloading content from the web, etc.

1.3.4 How do Search Engines Work?

Search engine aims to provide the most relevant search results in minimal time to their users. When we give a search query, we may get millions of results within a fraction of seconds. Surprisingly, actual work was done long before the query is supplied. A typical process of how a search engine works is depicted in Fig. 1.10. Despite searching the whole web instantly, the search engine's query processing module searches its databases against supplied keywords in the search query. The data bases contain metadata and indexes of selected web pages, out of billions of webpages across the WWW for the searching keywords. Out of selected webpages,the most relevant webpages are displayed in search results with the help of the ranking module. A search engine generally performs three functions:

1. **Crawling:** Every Search engine has some automated software (programs) which are known invariably as the bot, robot, web wanderers, spiders, crawler or indexer. The purpose of the spiders is to traverse and scan the world wide web for publicly available information.
2. **Indexing:** This is a process to organize and store the results found in the crawling function such that they can be further processed by search engine algorithms. A search engine does not store all information available on the webpage instead it stores details like title & description of the page, date of creation/updating, type of content, associated search terms, links coming to and from this webpage and other parameters required by its algorithms.

3. **Ranking:** This is the process of showing results in order of their relevance. Most relevant pages are shown first while the least one will be on afterward. This is done using the ranking algorithm of the search engine. Some dominating ranking factors are Links referring to this webpage, website age, associated keywords, mobile-friendly webpage, speed of webpage loading, time spent on a webpage, etc.

TYPE: Video Resources **Title:** Basic Search Strategies

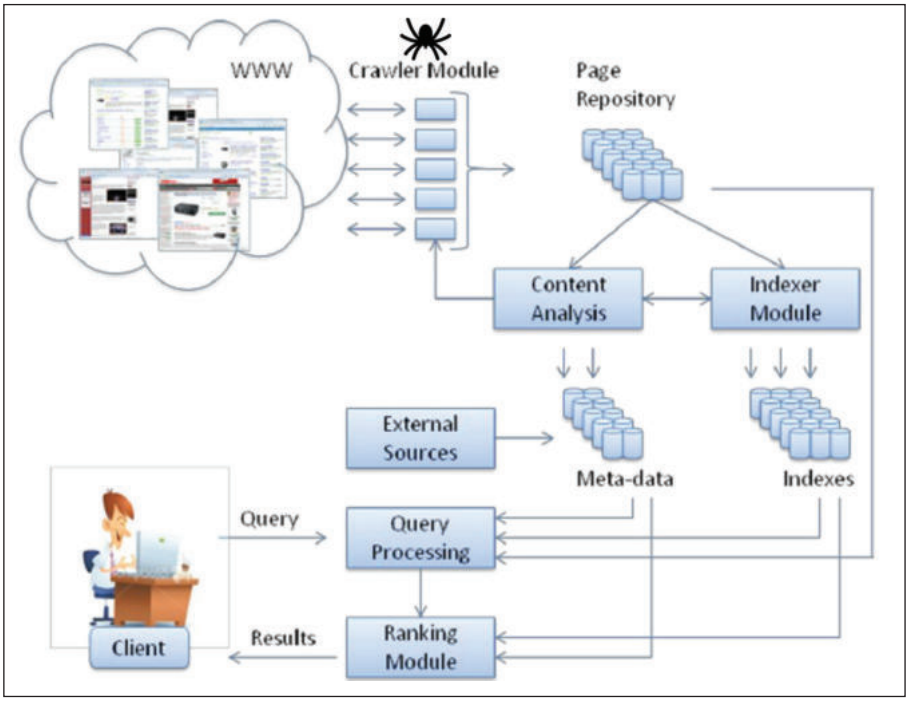


Fig. 1.10: Searching with Search Engines

Table 1.2: Google Search Symbols, Operators & Commands

Operator	Description	Example
Informational Search Queries		
define	Returns a definition of the given term.	define tolerance
time	Returns the current time at a particular location.	time Australia
to	Convert measurements from one unit to another.	12 inches to feet
in	Convert measurements from one unit to another.	650 EURO in INR
translate	Translates the queried terms into another specified language.	translate hello world german
map	Returns map result by giving map followed by location.	map andhrapradesh
stocks	Returns stock information of given company name.	stock wipro
weather	Returns the weather forecast for the given location or ZIP code.	weather bodhgaya or 824231

Basic Search Symbols		
-	Excludes search results that include this term.	best tablets -drawing
|	Returns search results that match terms on either side of the pipe. The same as writing "OR" between search terms.	computer | tablet
@	Returns search results that match a particular social media site.	aicte @facebook
#	Returns search results that include a specific hashtag.	#largestvaccinedrive
""	Returns search results that include all terms within quotes in the **exact** given order.	"Gods own country"
*	Returns search results where **any** words can be matched in place of the asterisk.	best * in Haryana
..	When placed between two numbers, returns search results that match within the number **range**.	computer 30k..40k inr
()	Used to **group search** terms and control the search logic of the query.	(lata | mukesh) songs lyrics
Most Popular Search Operators		
cache:	Show Google's cached version of a specific page.	cache:makeuseof.com
filetype:	Returns only search results that match a particular file extension.	"ITSystems"filetype:ppt
related:	Returns other websites that are similar to the queried website.	related:nytimes.com
site:	Returns only search results from a particular website.	Parenting site:https://www.unicef.org/india/
Other Search Operators		
inanchor:	Returns pages that are linked to using anchor text matching the search query.	inanchor:mental wellbeing
allinanchor:	Same as inanchor, but matching every term that appears after allinanchor.	inanchor:mental wellbeinghindi
intext:	Returns only search results that match in the page's body.	intext:no tobacco day
intitle:	Returns only search results that match in the page's title.	intitle:india tourism
inurl:	Returns only search results that match in the page's URL.	inurl:indiaculture

1.3.5 How to Search the Web?

Various popular variants of search engines are already discussed in our previous section. To perform a search, we have to open any desired search engine in our web browser. Now input (type) one or more keywords in the search box and then click on the search button or simply press the 'Enter key' on your keyboard to begin the search. We will get search results most relevant to our search phrase. If you are satisfied with any of the webpage presented in the search results, you may go through that webpage for your desired intention (navigation, information or transaction). In case of undesired results, you should redefine your search term with added keywords or you should look upon more options to enhance your searching. Searching can be more precise and enhanced using various operators provided by the search engine or by using capabilities of the search engine's user interface like advanced search options provided in google search.

Google Search Symbols, Operators & Commands

Now we discuss some prominent operators, commands of the dominating search engine-Google. We will also discuss some tips to cut short our searching results, to the actual required result. The Table 1.2 shows operators, their use in searching with examples.

Google Advanced Search

In addition to the above operators google also provide various filters to refine our search results within the user interface. Let's check step by step process (see Fig. 1.11) for advance searching:

1. The user has to open a web browser and navigate to the google search engine.
2. Type their search term in the search box e.g. "ecosystem restoration", by pressing enter or clicking the search button users will be presented with associated search results.
3. Users can view scrutinized results based on various provided categories like news, images, books, videos, maps, flight, finance, etc. For our explanation, I have selected image results by clicking on ***images***.

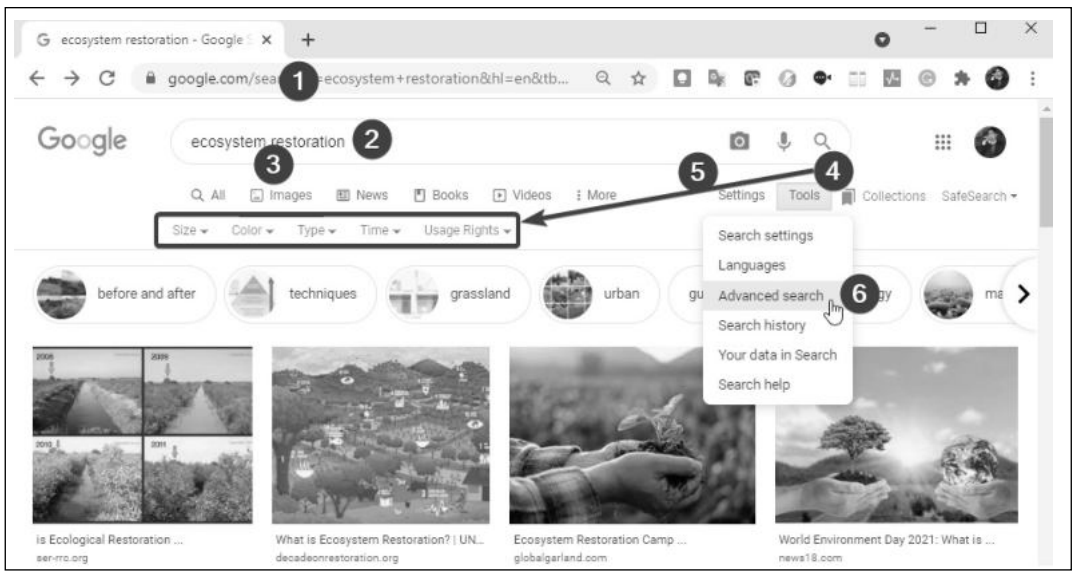


Fig. 1.11: Advanced Filters for Search

4. For each such category, some additional filters are associated, which are visible after clicking on the Tools button. As depicted by the arrow in step 4. (Fig. 1.11)
5. Similarly, News, Books, Videos & More categories provide their associated filters to refine search parameters to get more accurate & precise results. You may check them one by one by selecting the category and then *Tools* option

The advanced search facility can be accessed from the user interface as depicted in figure (Fig. 1.12) or we can access it directly by URL: *google.com/advanced_search*

TYPE: Video Resources **Title:** How Google Search Works?

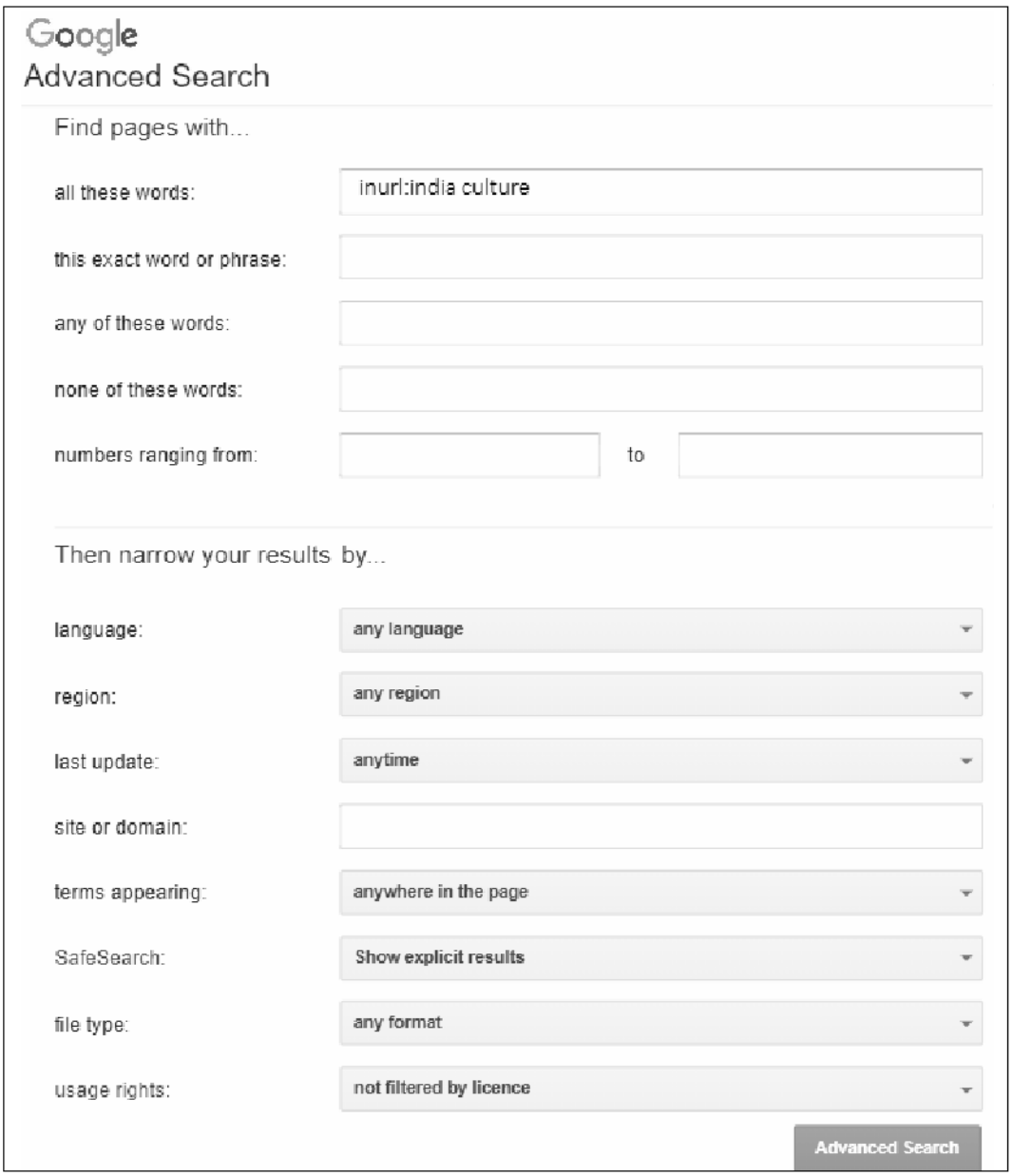


Fig. 1.12: User interface for Google Advanced Search

The functionality of almost all google operators is provided via this graphical user interface of google shown in Fig. 1.12. Each field is equivalent to some operator we discussed in Table 1.2.

1.4 AWARENESS ABOUT DIGITAL INDIA PORTALS

The government of India has developed many portals and IT-Based infrastructures to empower its citizens. Those portals in which services and information are presented and updated by the central government and

whose aim is nationwide are called ***National Portals*** e.g. ***india.gov.in*** or ***mygov.in***. The portals to support and implement the digital India program are known as Digital India portals. Every citizen of India can take leverage and participate in such portals.

1.4.1 What is Digital India?

In the era of the information & technology revolution, information & services are widely delivered with the help of the internet. Countries achieve Good Governance by employing e-Governance. As well defined on *https://digitalindia.gov.in* national portal "*The Digital India program is a flagship program of the Government of India with a vision to transform India into a digitally empowered society and knowledge economy*". It was launched in July 2015 with the huge budget allotment of rupees 1.13 lakh crore. The main aim behind this visionary program is to digitally empower the citizens of India. The Program envisages providing government services by electronic means to reduce paperwork and enhancing accountability in the system. It includes a plan to connect rural areas with high-speed internet highways. It is implemented by the Government of India (GOI) and being coordinated by MeitY (Ministry of Electronics and Information Technology). Honourable prime minister heads the monitoring committee. The digital India program is focused to transform the India with the indigenous talent and use of information technology as shown in Fig. 1.13.

Fig. 1.13: Digital India Focus

Digital India Program is centered on three keyvision areas as defined below

1. Digital Infrastructure as a Utility to Every Citizen
   - Availability of high-speed internet as a core utility for delivery of services to citizens
   - Cradle to grave digital identity that is unique, lifelong, online and authenticable to every citizen
   - Mobile phone & bank account enabling citizen participation in digital & financial space
   - Easy access to a Common Service Centre
   - Shareable private space on a public cloud
   - Safe and secure cyber-space
2. Governance and services on demand
   - Seamlessly integrated services across departments or jurisdictions
   - Availability of services in real time from online & mobile platforms
   - All citizen entitlements to be portable and available on the cloud
   - Digitally transformed services for improving ease of doing business
   - Making financial transactions electronic & cashless
   - Leveraging Geospatial Information Systems (GIS) for decision support systems & development
3. Digital empowerment of citizens
   - Universal digital literacy

- Universally accessible digital resources
- Availability of digital resources/services in Indian languages
- Collaborative digital platforms for participative governance
- Citizens not required to physically submit Govt. documents/certificates

TYPE: Video Resources **Title:** What is Digital India?

1.4.2 Pillars of Digital India Program

Digital India program covers several ministries & departments hence it is an umbrella activity which requires collaborative work among its stakeholders. Different ministries, departments work for their targeted task keeping larger goal and vision areas in their minds. Digital India initiative is also aimed to reinforce the nine pillars of growth areas as depicted in Fig. 1.14.

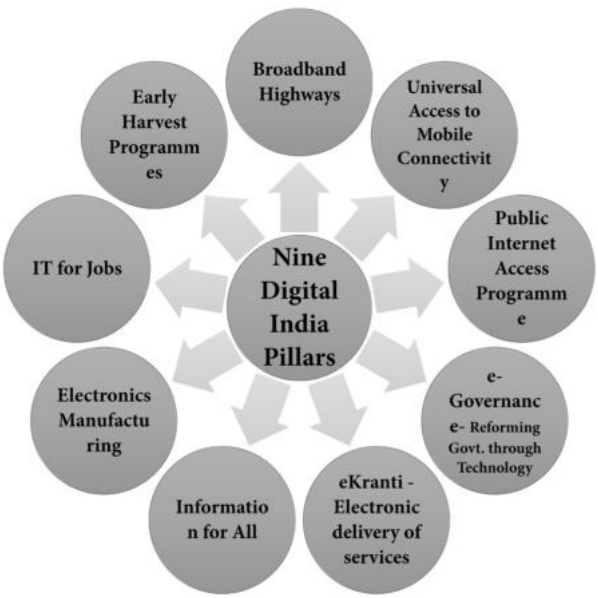


Fig. 1.14: Digital India Pillars

Based on the vision areas of digital India,these portals are classified into three categories. Most commonly used portals and their brief descriptions are included in the below Tables 1.3 to 1.5. Learners are suggested to visit and analyze key features of these portals.

Table 1.3: Digital India Portals (Infrastructure)

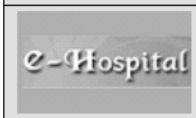
Digital India Initiative		Website	Description
AADHAAR	AADHAAR	https://uidai.gov.in	The largest biometrics based identification system in the world for effective service delivery to citizens.

	COE-IT	http://www.coe-iot.in	Center for excellence for Internet of Things to build industry capable talent, start-up community and an entrepreneurial ecosystem for IOT
	CERT-IN	http://www.cert-in.org.in	Computer emergency response team-India
	CSCS	https://csc.gov.in/	Common service centers portal
	CYBER SWACHHTA KENDRA	http://www.cyberswachhtakendra.gov.in/	India initiative to create a secure cyber space by detecting botnet infections
	DIGILOCKER	https://digilocker.gov.in/	It's a secure cloud based platform for issuance, sharing and verification of critical lifelong documents.
	(DISHA)	http://www.ndlm.in/	Digital Saksharta Abhiyan or National Digital Literacy Mission to impart IT training
	DIGITIZE INDIA PLATFORM	https://digitizeindia.gov.in/	Programme to provide digitization services for scanned document images
	DBT	https://dbtbharat.gov.in/	Direct benefit transfer aim to reform government delivery system
eSign	ESIGN	http://cca.gov.in/	An online electronic signature service
	ESSO-INCOIS	http://www.incois.gov.in/portal/index.jsp	to provide the best possible ocean information and advisory services
	GOVT. E-MARKETPLACE	https://gem.gov.in/	It is single window solution for online procurement of common use Goods & Services required by various Government Departments / Organizations / PSUs
	IRCTC CONNECT	https://www.irctc.co.in/	Next generation e-ticketing system to facilitates search and book train tickets, check reservations or cancel them, and get upcoming journey alerts

	JEEVAN PRAMAAN	https://jeevanpramaan.gov.in/	A biometric enabled digital service for pensioners to streamline the process of issuing life certificate
	MEGHRAJ	https://cloud.gov.in/index.php	Cloud Computing initiative to accelerate delivery of e-services in the country
	MOBILE SEVA APP STORE	https://apps.mgov.gov.in	To facilitate the process of development and deployment of suitable mobile applications
	NSM	https://nsmindia.in	National Super Computing Mission to empower the national academic and R&D institutions, spread across the country
	OPEN DATA	https://data.gov.in/	To publish datasets, documents, services, tools and applications for public use
	RAS	http://ras.gov.in/	Rapid Assessment System for continuous feedback for e-services delivered by Government of India and State Governments
	SWIFT	https://www.icegate.gov.in/SWIFT/	Single window interface for trade- a Project to facilitate the Trading Across Borders in India

Table 1.4: Digital India Portals (Service Based)

Digital India Initiative		Website	Description
	SUGAMYA BHARAT ABHIYAAN & Mob App	http://accessibleindia.gov.in/content/	A crowd sourcing platform to comprehensively obtain information on inaccessible places across the country
	BHIM	http://www.bhimupi.org.in/ or App from google play store	An app that makes payment transactions simple, easy and quick using Unified Payments Interface (UPI)
	DIGITAL AIIMS	http://ehospital.nic.in/ehospital/	The Unique Health Identification Number gave every Patient visiting AIIMS a Digital Identity
	E-PANCHAYAT	http://epanchayat.in/	To provide comprehensive software solution attempting automation of Gram Panchayat functions

	EGREETINGS	https://egreetings.gov.in/	Aims to promote a contemporary and eco-friendly method of sharing greetings
	E-HOSPITAL	http://ehospital.nic.in/ehospital/	A Hospital Management Information System (HMIS) for internal workflows and processes of hospitals
	ENAM	http://www.enam.gov.in/NAM/home/index.html	A pan-India electronic trading portal to create a unified national market for agricultural commodities
	E-PATHSHALA	http://epathshala.nic.in/	Provide e-resources including textbooks, audio, video, periodicals and a variety of other print and non-print materials through website and mobile app
	ESAMPARK	https://sampark.gov.in	A mechanism to connect the government directly with citizens across India by running mailer, outbound dialing and SMS campaigns
	GSTN	http://www.gstn.org/index.php	Goods and service tax network is a uniform interface for the tax payer and a common and shared IT infrastructure between the Centre and States
	KHOYA PAYA	http://khoyapaya.gov.in/mpp/home	A citizen-based website to exchange information on missing and found children
	KISAN SUVIDHA	http://www.kisaansuvidha.com/	An mobile app developed to help farmers get relevant information instantly
	MRAKTKOSH	http://www.eraktkosh.in/	The web-based mechanism interconnects all the Blood Banks of the State into a single network
	NCS	https://www.ncs.gov.in/	National Career Service portal facilitates registration of job seekers, job providers, skill providers, career counsellors,, etc.
	NVSP	http://www.nvsp.in/	Services such as access the electoral list, apply for voter id card, apply online for corrections in voter's card, view details of Polling booth, Booth Level officer, Electoral Registration Officer, etc.

	PASSPORT SEVA PROJECT	http://www.passportindia.gov.in/	Enables simple, efficient and transparent processes for delivery of passport and related services
	SHAALA DARPAN	https://darpan.kvs.gov.in/shaaladarpan/	An e-Governance platform for all Kendriya Vidyalayas in the country
	SOIL HEALTH CARD	http://www.soilhealth.dac.gov.in/	Aims at promoting Integrated Nutrient Management
	SWAYAM	https://swayam.gov.in	Aim to achieve access, equity and quality for education by best teaching learning resources and online MOOCS courses to all.
	UMANG	https://umang.gov.in App from google play store	Unified Mobile Application for New-Age Governance- a mobile app to facilitate a single point of access to all government services
	UTS APP	https://www.utsonmobile.indianrail.gov.in/RDS/	Enables booking unreserved paperless journey ticket, issue/renew season ticket and platform ticket

Table 1.5: Digital India Portals (Empowerment)

Digital India Initiative		Website	Description
	AEPS	https://www.npci.org.in/	It is a payment service empowering a bank customer to use Aadhaar as his/her identity.
	BPO SCHEME	https://ibps.stpi.in/	Seeks to incentivize establishment of 48,300 seats in respect of BPO/ITES operations across the country.
	MYGOV	https://mygov.in	A unique first-of-its-kind participatory governance initiative involving the common citizen at large.
	NMEICT	http://www.nmeict.ac.in	Scheme to leverage the potential of ICT, in teaching and learning process for the benefit of all the learners in Higher Education Institutions

	PMGDISHA	https://www.pmgdisha.in/	Scheme to make six crore persons in rural areas, across States/uts, digitally literate, by covering one member from every eligible household
	PMKVY	http://www.pmkvyofficial.org/	To enable a large number of Indian youth to take up industry-relevant skill training that will help them in securing a better livelihood
	SMART CITIES	http://smartcities.gov.in/content/	Provide updated information about smart cities projects and related processes.

Interesting Facts

- Aadhar Enabled Banking Transactions are growing continuously. In May 2021, Approx. 24,197 Crore Rupees transaction takes place. New India is going digitally.
- As of July 2021, DIGILocker has 66.87 Million registered users and issued 4.32 Billion authenticated documents.

1.5 STATE PORTAL

In the public welfare state system, every state tries to provide better facilities to its citizens. Government activities, schemes are implemented at the grassroots level to its citizens by various government departments, offices under the state government. Through the state web portal, the state government performs tasks like dissemination of information, applications for various government schemes & displaying their current status, feedbacks & disposal of grievances of departments, etc. Therefore, to provide digital services to its citizens (mostly state wide) by keeping them at the center, they are called ***state portals.*** Thus, the State portal is a nodal source of information about a particular state and its various departments and their associated services accurately and comprehensively.

1.5.1 Features of State Portals

1. The state portals are useful to provide single point information access to schemes and services of concerned departments like health, agriculture, education, employment, Taxes, pension, etc. of the particular state.
2. It transparently provides information and helps in reducing corruption.
3. These are part of e-governance & reduces paperwork and time to disseminate information.
4. These portals make government departments more accountable as they know they are continuously monitored.

1.5.2 How to Navigate a State Portal?

1. To open a state portal of our interested state we need to type its URL into the address bar of the browser and press enter.
2. If URL is not memorized then we should find an authenticated URL in any of the below ways:
   a. We may search it on search engines (e.g. Google) with some precise keywords.
   b. use hyperlinks from validated social media handles of the Government department.
   c. physical posters or IEC (Information, Education & Communication) material from the state government may have a valid URL for the state portal.
   d. open any reputed website which contains hyperlinks to the state portal. For our example,we may visit any of the below national portal's URL
   https://knowindia.gov.in/states-uts/ or *https://www.india.gov.in/india-glance/states-india*
   Both webpages provide links to state web portals of India. You may click on any of the state's name (Hyperlink) or link icon 🔗 in front of the state name to navigate to the state portal. A user interface for the first URL is depicted in Fig. 1.15.

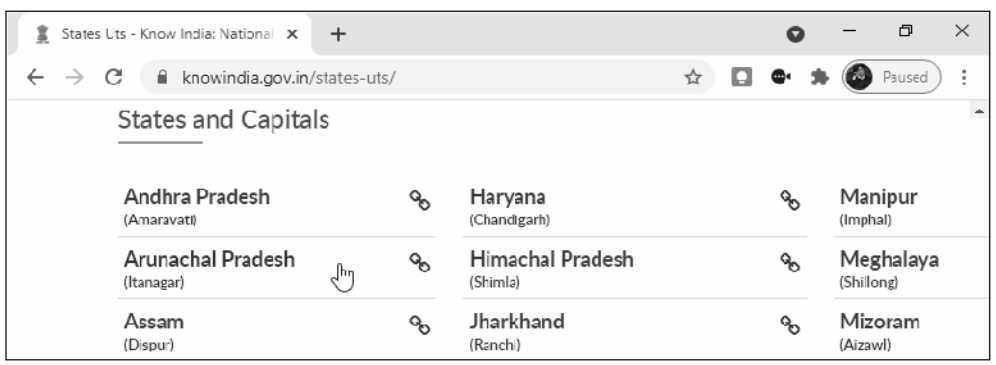


Fig. 1.15: A National Portal with Hyperlinks to State Portals

3. By clicking on any state, we will see the state portal window of that particular state, for our case we got the portal interface of the Government of Arunachal Pradesh as shown in Fig. 1.16.

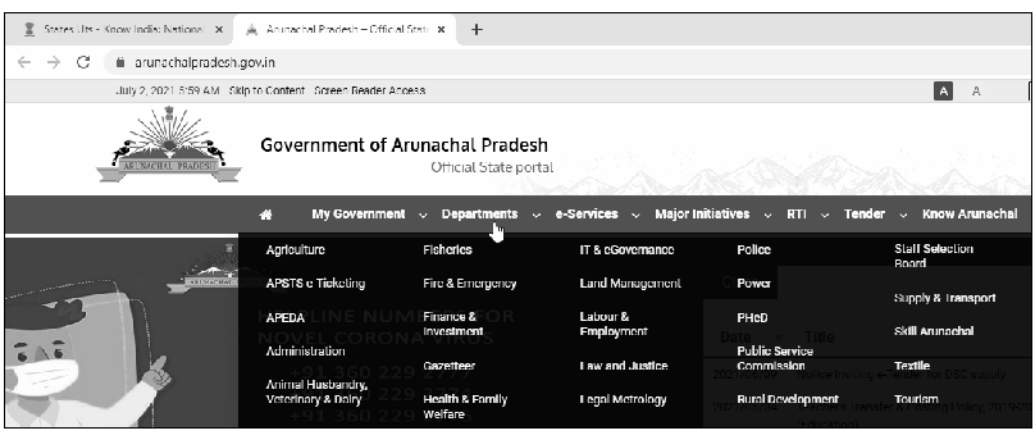


Fig. 1.16: A State Portal with Hyperlinks to Various Department

A state portal generally has hyperlinks to its various government departments. As all such portals also serve state wide, these are also termed as state portals. Thus, we may further navigate to any of the department specific state portals of the Arunachal Pradesh state government as shown in Fig. 1.16.

1.6 COLLEGE PORTAL

A college portal is a web portal that provides information related to different stakeholders of a college like its current students and their families, alumni network, faculties and staff personals of the college, new aspirants' candidates who wish to get admission in the college and higher officials, etc. With the help of this interface colleges or educational institutes can maintain records of their student in a systematic manner. Higher officials of college may monitor college activities and processes in any time any where concept. This portal plays an important role in providing up-to-date information about college related works and activities like departmental notices, information about placements and exams, fees due date, curriculum details, etc. Thus, it helps to maintain all records of the college and maintain a management information system (MIS) for an institute. Since the responsibility to present and maintain all the information is at the college level, it is called a *college web portal.*

Depending on the updating frequency & complexity, the college portal can be categorized into static or dynamic portals. If it is a simple web portal to provide non changing information, it is a static portal. On the other hand, if a portal is developed with the functionality to update it continuously, it is referred to as a dynamic portal. It may provide a facility for user login and users can even update his/her personal information. In addition, an advanced portal enables its usersto retrieve customized information from their institute.

How to Navigate a College Portal?

1. To open a college portal, type its URL into the address bar of the browser and press enter.
2. If URL is not memorized then we should find an authenticated URL in any of the below ways;
   a. Physical posters or IEC (Information, Education & Communication) material from college may have a valid URL for the college portal.
   b. We may search it on search engines (e.g., google) with some precise keywords for college.
   c. Use hyperlinks from validated social media handles of the college or its official person.
   d. We may search it in the national portal or state portal of the desired state having indexing of its colleges. e.g., we may visit below national portal s*https://aishe.gov.in/* or *http://www.knowyourcollege-gov.in/*
   e. Open any other reputed website with indexing for college portals of India like shiksha.com, collegedunia.com, etc.
      for our example, if we want to visit the official website of Government Polytechnic College, Barmer (considering we do not know its URL) we may follow mentioned steps.
      i. Open state portal of higher and technical education department of Government of Rajasthan by typing *www.hte.rajasthan.gov.in*
      ii. Click on the "Department Of Technical Education" in the menu tab named "Departments". It will redirect to URL *https://hte.rajasthan.gov.in/dept/dte/*
      iii. Now click on the "College" menu tab, it will redirect to https://hte.rajasthan.gov.in/dept/dte/college.php. The page will show a complete list of polytechnic colleges under the department of technical education of Rajasthan state.

iv. By clicking on the college hyperlink, we get the college portal interface as depicted in Fig. 1.17

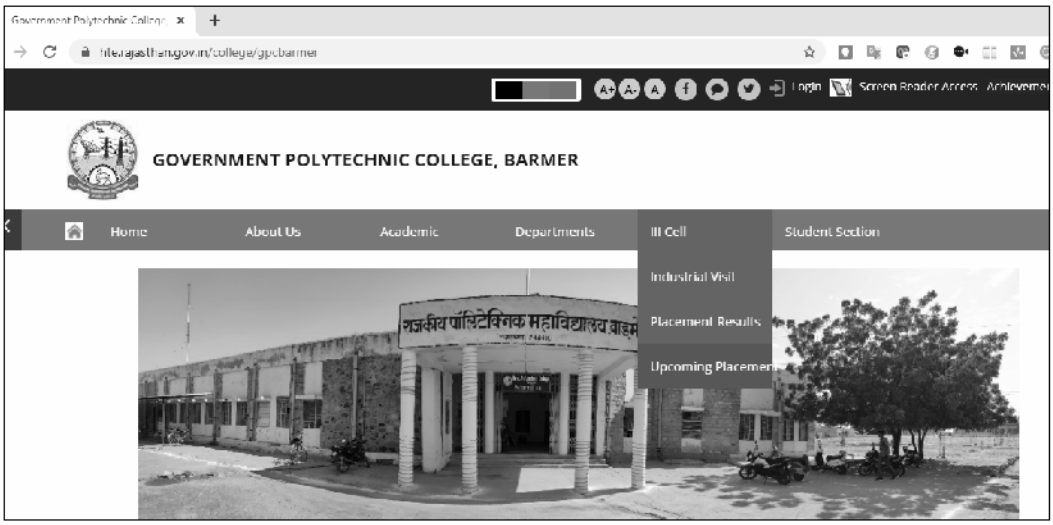


Fig. 1.17: A College Portal

COMPUTER SYSTEM

Today, computers are not only used in commerce and business but also in various fields like medicine, research, educational institutions, launching a satellite, etc. Computers are available in different sizes and have different capabilities of processing commonly known as configurations. We need different types of hardware to construct a computer. Computer hardware is a collective term used to explain various tangible components of computers. Each hardware component has its functionality and is attached in a specific manner to form a computer system. A typical block diagram of a computer system is shown in Fig. 1.18. Now we will discuss the basic components that make up a computer system.

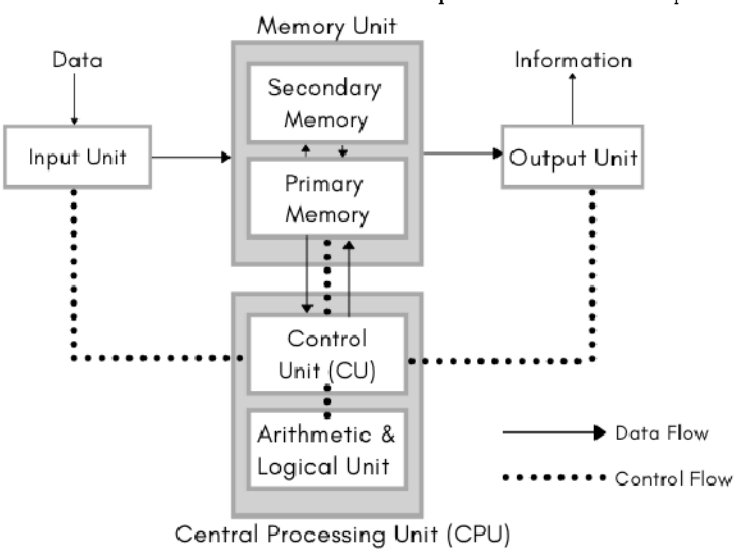


Fig.1.18: Computer System Block Diagram

TYPE: Video Resources **Title:** Inside a Computer

1.7 CENTRAL PROCESSING UNIT (CPU)

The CPU consists of arithmetic and logical unit (ALU), control unit (CU) and memory storage unit. Collectively they form the brain of the computer. CPU is the place where the actual processing of data takes place on the execution of the program. The CPU is responsible for processing most of the data, turning input data into output data. The CPU is one of the main components that will improve the performance of your computer. CPU is being used in almost all kinds of digital processing equipment like desktops, laptops, tablet computers, smartphones, even in our television set and many more devices. Colloquially it is also termed asa processor, microprocessor or central processor. The two main companies that manufacture the desktop CPU are AMD and Intel.

1.7.1 Microprocessor

It is a silicon chip with ALU, register circuits and control circuits. The microprocessor is capable of carrying out a large number of functions like receiving data, processing and storing the results and outputting the required results on a single integrated circuit.It has the responsibility to perform ALU operations and control the components connected to it like memory, input output devices, etc. Thus, it is a programmable device that takes binary data as input, performs processing as per instructions loaded in memory and generates results in binary form. A conventional microprocessor chip with pins is shown in the figure 1.19.

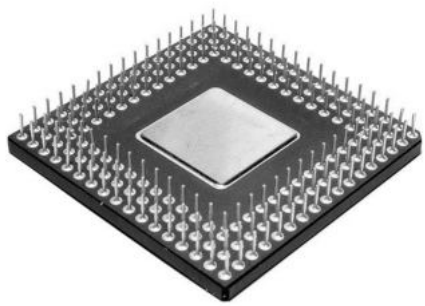


Fig. 1.19: A Microprocessor Chip

1.7.2 Arithmetic and Logical Unit (ALU)

An ALU is a major component of the CPU of a computer system. It performs all the arithmetic & logical operations for the computer system e.g., addition, subtraction, compare, complement, shift, etc. It is a combinational digital circuit and an ALU can be designed by engineers to calculate any operation. As the operations become more complex, the ALU also becomes more expensive and it will take up more space in the CPU. *Generally, the ALU is made up of three parts:*

a. Adder where the actual calculations task place.
b. Register which stores the information temporarily.
c. Accumulator in which the intermittent results of the calculations are kept.

1.7.3 Control Unit (CU)

This is an important part of the CPU which supervises all the operations taking place in it. Its main aim to send and receive control signals to all parts of a computer system. The control signals are helpful in the smooth execution of instructions in the CPU, communication over buses to memory and IO devices.Via control signals, CU facilitates that all tasks in computer performedat right time and in the correct order. It also directs other units of the system to carry out their respective function. Thus, CU regulates and integrates the operations of the computer. It fetches an instruction from a program stored at main memory, decodes it and sends control signals to other units of the computer system.

1.7.4 Memory Unit

The instructions and data given to the computer are stored in the memory or storage unit. This data along with the program instructions are used by the CU and ALU. It is also used to store intermittent results and information (final results). Types of memory are discussed in detail, in the next topic.

The smallest unit of memory is called a 'Bit'. A bit can have the value 1 or 0 which is known as binary values. Groups of eight bits form a Byte and similarly higher order units are formed. The Table 1.6 shows measurement units for digital data with their denoting symbol and corresponding capacity.

Table 1.6: Measurement Units for Digital Data

Unit	Symbol	Capacity
Bit	b	1 or 0 (on or off)
Byte	B	8 bits
Kilobyte	KB	1024 Bytes
Megabyte	MB	1024 Kilobyte
Gigabyte	GB	1024 Gigabyte

Unit	Symbol	Capacity
Terabyte	TB	1024 Gigabytes
Petabyte	PB	1024 Terabyte
Exabyte	EB	1024 Petabytes
Zettabyte	ZB	1024 Exabytes
Yottabyte	YB	1024 Zettabytes

Computer memory is one of the most important components of the computer system. Computer memory is a vital resource that is managed by the operating system.When the data is sent to the memory it is kept at some particular location called to address. The data can be retrieved by the computer from this address as and when required.

TYPE: Video Resources **Title:** Basic Computer parts

1.8 TYPES OF COMPUTER MEMORY

The computer system makes use of different types of memory depending upon the functional requirement. Depending on the direct accessibility of memory by CPU, memories are classified as a primary and secondary type. Further, the main memory is divided into two types based on the data retention by the system memory, volatile and non-volatile. A detailed classification of computer memory

according to direct CPU accessibility, data retention, read-write technology and storage media type is presented in Fig. 1.20.

1.8.1 Primary Memory

Primary memory is known as main memory or internal storage because it is directly accessible by the CPU. It is used to store program instructions, data and intermittent results. It is made of semiconductor devices. Due to its fast access rate and circuit complexity, it is expensive in comparison to secondary memory. A computer can't work if there is no primary memory installed into the system. RAM, ROM, Cache Memory are an example of primary memory.

Random Access Memory (RAM)

It is called Random access memory due to its feature that access time to any stored information is independent of the physical location of data. RAM is also known as a temporary or volatile memory because whatever data stored in it remains till the computer is switched ON. When the current is switched off, all stored data will bewiped out or lost. RAM is the most essential element of acomputer system because, without it, the system cannot perform its tasks. RAM is further classified into two types (a) Static RAM (b) Dynamic RAM

Static Random Access Memory (SRAM): The word static indicates that the memory retains its contents as long as power remains supplied. However, data is lost when the power gets down due to its volatile nature. SRAM is faster and much more expensive than DRAM.

Dynamic Randon Access Memory (DRAM): DRAM is constructed of tiny capacitors that leak electricity. Designers use DRAM because it is much denser (can store many bits per chip), uses less power, and generates less heat than SRAM. For these reasons, both technologies are often used in combination: DRAM for main memory and SRAM for the cache.

Read-only Memory (ROM)

The programs stored in ROM are permanent and are not lost or erased when the current is switched off. So, it is a nonvolatile memory type. The programs stored in ROM are generally of critical in nature & given by the manufacturer of the computer and includes operating system programs, booting program, etc. ROM is available in different types, including PROM, EPROM and EEPROM.

Programmable Read Only Memory (PROM): 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 programmer.

Erasable and Programmable Read Only Memory (EPROM): It is programmable with the added advantage of being reprogrammable (erasing an EPROM requires a special tool that emits ultraviolet light).To reprogram an EPROM, the entire chip must first be erased.

Electrically Erasable and Programmable Read Only Memory (EEPROM): 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 (milli second). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip.

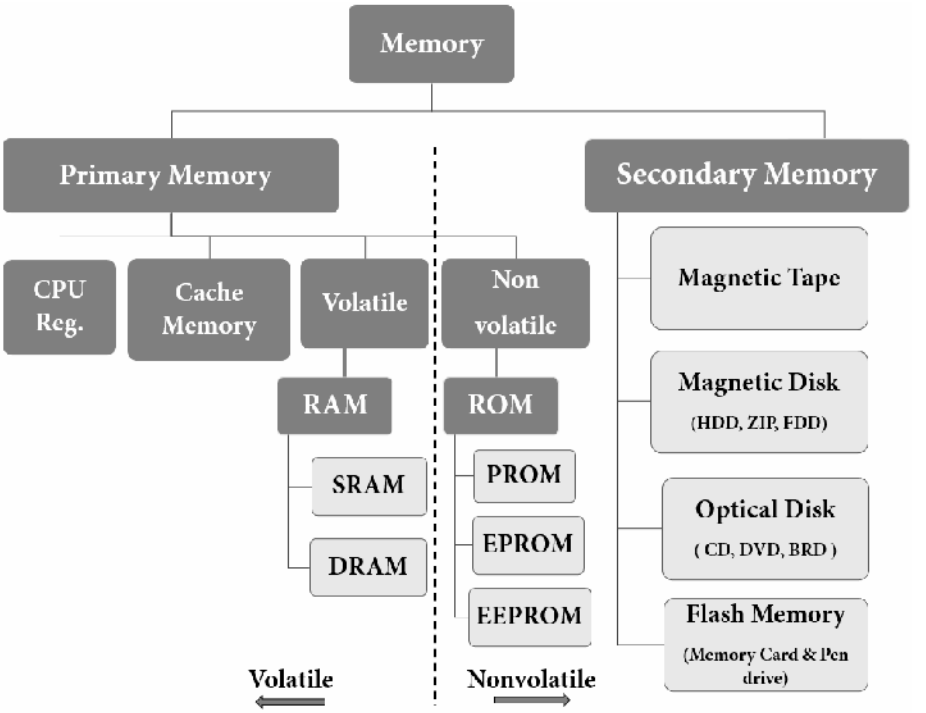


Fig. 1.20: Classification of Memories

Flash memory: It is essentially EEPROM with the added benefit that data can be written or erased in blocks, removing the one-byte-at-a-time limitation. This makes flash memory faster than EEPROM.

1.8.2 Secondary memory

Generally, the amount of storage available in the main/primary storage unit becomes insufficient when loading large programs or simultaneous processing of programs e.g. complex business problems. In such situations, it is necessary to use external or auxiliary memory for storing data. Here the secondary memory comes into the picture and it is mainly used to store data permanently. It is also termed as 'external memory' due to lack of direct access between CPU and the memory. It is a nonvolatile memory; data retains even after the computer system is switched off or electric power is disconnected.

1.9 DISPLAY

A display is an output device to present information in visual form. It may be an external monitor or built-in screen with the digital device e.g., computer, mobile, ATM, advertising boards, etc. A computer display is simply the screen that will give you, your video output from the computer. A computer monitor works with the video card located inside the computer case, to display images and text on a screen. Most monitors have some control buttons that allow us to change the display settings of the monitor. With the change in display screen technology, different types of monitors are available in the market.

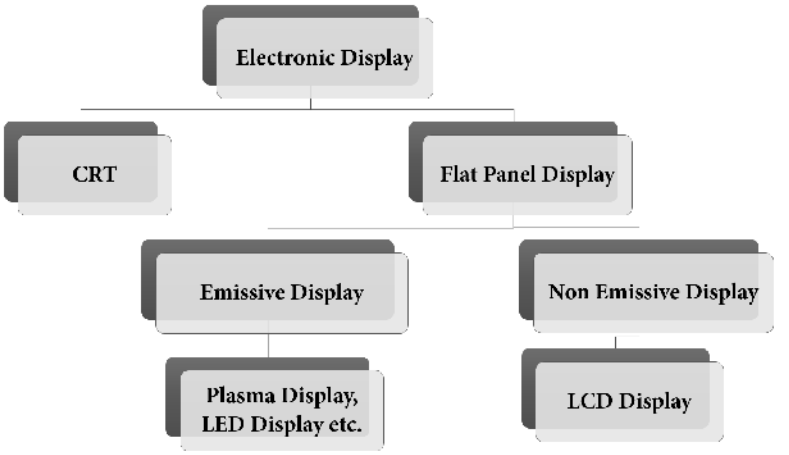


Fig. 1.21: Types of Display

Types of the display are depicted in Fig 1.21. Now we will discuss key features and differences of different displays.

1. **CRT (cathode ray tube) monitors:** These are older computer monitors built using cathode ray tubes (CRTs). A typical CRT monitor is shown in Fig. 1.22. The monitors employ CRT technology, which was used most commonly in the manufacturing of television screens. A cathode ray tube is a vacuum tube containing an electron gun at one end and a fluorescent screen at another end. The use of CRT made them heavy and caused them to take up a lot of desk space.
2. **LCD (liquid crystal display) monitors:** Most modern monitors are built using LCD technology and are commonly referred to as flat screen displays. These thin monitors are light weighted, electricity saviour and take up much less space than the older CRT displays. An LCD is composed of two pieces of glasses with a thin layer of liquid crystals in between. When a voltage is applied to the glasses, the orientation of liquid crystals will be changed. This change in the crystal's orientation (called polarization) will make either a dark or a light area, creating a character or image on the display.

   A **TFT monitor** uses thin-film transistor technology in an LCD. It is a variant of LCD monitors and is dominantly being used in current monitors.

Fig. 1.22: Display Devices (a) CRT Monitor (b) LED Monitor (c) DLP Projector

3. **LED (light-emitting diodes) monitors:** LED monitors are the latest types of monitors in the market today. These are flat panel displays that make use of light-emitting diodes for

back-lighting, instead of cold cathode fluorescent (CCFL) backlighting used in LCDs. The advantages of LED monitors are that they produce images with higher contrast, have a less negative environmental impact when disposed of. Modern electronic devices such as mobilephones, TVs, tablets, computer monitors, laptops screens, etc., use a LED display to display their output.

4. **DLP Monitors:** DLP stands for Digital Light Processing, developed by Texas Instruments. It is a technology, which is used for presentations by projecting images from a monitor onto a big screen. It gives better quality pictures that can also be visible in a lit room normally.
5. **Plasma Monitors:** The plasma monitor has a flat screen, and it has small fluorescent lights with colour that are lit up to form images on the screen. plasma monitors have a very wide screen using very thin materials.
6. **OLED Monitors:** OLED stands for organic light-emitting diode. This type of monitor is thinner and lighter, and it offers incredible contrast and colour. It works without a backlight as it transmits visible light. Flexible and transparent displays are also possible using OLED.
7. **Touch Screen Monitors:** These monitors perform both input and output functions. It enables users to interact with the computer by using a finger or stylus instead of using a mouse or keyboard. When users touch the screen with their finger, it occurs an event and forwards it to the controller for processing. It takes input from the users by touching menus or icons presented on the screen.

1.10 KEYBOARDS

A keyboard is the primary input device used with the computer similar to an electronic typewriter. It is used to input data and instructions of a user in a computer system. A keyboard is composed of buttons used to create letters, numbers, symbols, and perform functions.A keyboard is connected to a computer system using a cable or wireless connection. Some keyboards also have additional functions like volume control buttons to power down or sleep the device even a built-in trackball mouse, intended to provide the easiest way to use both the keyboard and the mouse.The various types of keyboards are used by users for associated purposes like a qwerty keyboard for general purpose uses, a gaming keyboard for game lovers, a virtual keyboard for software inputting, an ergonomic keyboard for physiological consideration and a multimedia keyboard for convenient web surfing and music play, etc. A keyboard has various keys some are logically grouped and a name is assigned to them. A QWERTY layout keyboard and its various keys are depicted in Fig. 1.23.

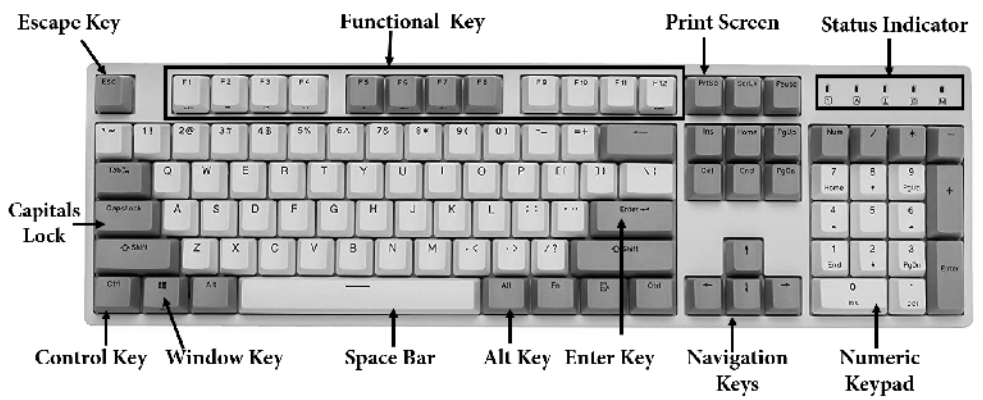


Fig. 1.23: Keys on Keyboard

1. **Function keys:** The topmost row of the keyboard have function keys. These are twelve keys F1 to F12. Each of these keys is used for a special purpose and assigns some system commands to them. For different software, these can be customized to perform a specific task. e.g., some shortcut of command can be assigned.
2. **Character keys:** These are keys which also present in a traditional typewriter too e.g. A-Z, a-z, 0-9, Tabs, Caps, are those keys. The keys are used to type letters, punctuation and other characters.
3. **Modifier keys:** These keys do nothing by themselves but with help of these keys, the functions of other keys are modified. Ctrl, Alt, Shift, AltGr comes under this group.
4. **Navigation keys:** These are also termed cursor control keys. Used to navigate cursor in any direction e.g., left [←], right [→], up [↑] and down [↓], beginning of line or screen (Home), end of line or screen (End).
5. **Numeric keypad:** Numeric keys of keypad i.e 0-9, NumLock, -, +, /, * and Del keys forms this group.
6. **System command keys:** Some keys have important functions other than printing characters, depending on the type of application where they are being used. These can be interpreted by the computer system as formatting or important commands to the system.
   a. **PrtSc:** Print Screen key is used to capture the entire screen and send it to the clipboard.
   b. **Break/Pause:** Not being used for predefined purpose nowadays. We can still use it to assign other tasks like terminate a program.
   c. **Esc:** Escape key is used to quit a dialogue box, as a quit or stop signal.
   d. **Enter:** In a text editor window, it is used to terminate a paragraph and request for the next new line. For a command line, enter key is a signal to process the command.
   e. **Shift:**The shift key is used to type more symbols than visible on the keyboard. e.g when we press the 'a' key + ⇧ Shift key it will produce 'A'
   f. **Window:** Window **key (⊞)** is used to open the start application menu on the windows operating system.
   g. **Space Bar:** It is used to provide space between words during typing. In physical appearance, it is a wide key on the keyboard.
   h. **Backspace:** The backspace key erases the text to the left of the cursor's position. It is generally useful for correcting typos.

Interesting Facts

On most widely used QWERTY keyboard, the word 'Typewriter' is the longest word which can be typed by pressing letters of same row i.e., top row.

1.11 MOUSE

A mouse is a handheld input device that controls the pointer in a GUI (Graphical User Interface). It is the most widely used pointing device and can move and select text, icons, files, and folders. In a desktop computer the mouse is placed on a flat surface like mouse pad or desk in front of computer. When we have a mouse in our palm and we move the palm in any direction,the mouse will convert the palm's movement into an equivalent digital signal. The digital signal is used to move the pointer on the computer screen. Some basic operations of a mouse are as below:

1. **Point**: To move your mouse pointer ( ) to a specific location on the screen.
2. **Click**: It is pointing to an item and then single time press and release of the mouse's main button i.e., left mouse button. Generally, this is done to select an item or menu command or to identify a location on a computer screen.
3. **Right-Click**: It is the press of right button of a mouse. Generally, to open a dropdown menu list to choose what we can do more with the item, like copy, paste, open, print, etc.
4. **Double Click**: It is pressing & releasing of the left mouse button on a spot twice, rapidly.
5. **Drag & Drop**: It is a process of pointing an icon on the screen, pressing the left mouse button (without releasing it), moving the mouse pointer to a different location and release the left button. To move an item is called dragging where as placing it somewhere is dropping.
6. **Scrolling**: Mouse with single axis digital wheel is very common nowadays. It can be depressed and used as a third button for scrolling. Scrolling is a process to navigate a webpage or document with a given scroll button.

Some mouse has some extra buttons for performing other special tasks like webpage forward or backward, volume up or down. Mice are available in both wireless and physical wired connections. Fig. 1.24 shows the traditional mechanical mouse and the most popular wireless mouse of nowadays.

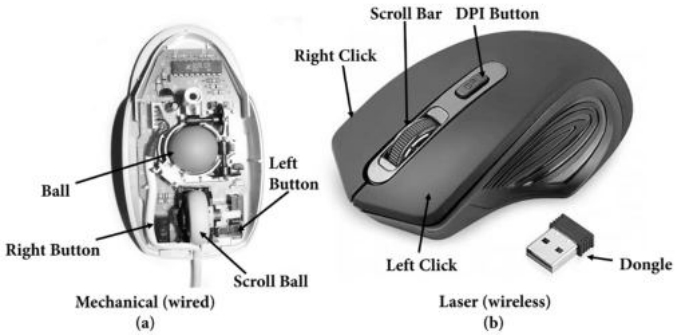


Fig. 1.24: Common Parts of Computer Mice (a) Mechanical (b) Wireless

1. **Mechanical mouse**: As the name implies these mice have some mechanical structure with a hard rubber ball to detect the motion of the mouse. Sensors inside the assembly interpret the rubber ball movement into the equivalent electronic signal. Due to mechanical driven functionality, its parts like wheels and sensors will wear out over time.
2. **Optical and laser mouse**: Uses an LED sensor and imaging arrays of photodiodes to detect the relative movement on the underlying surface. Such mice are not able to work properly on surfaces which does not reflect light properly like glass, plastic, etc. *A **laser mouse*** is also an optical mouse having laser light for sensing mouse movement despite LED or photodiode.

TYPE: Use of ICT (A Webpage) **Title:** Mouse tutorial

Interesting Facts

The first computer Mouse which was constructed in the year 1964 was made out of **wood** and developed by Doug Engelbart.

1.12 HARD DISK DRIVE (HDD)

The standard hard disk drive (HDD) is a type of nonvolatile memory (NVM). HDD stores operating systems files, application problems, media and other documents. A hard drive uses a disk and magnets to write data on the disk permanently, even in the event of a power failure. HDD can be used to store and retrieve digital information using platters or rotating disks. Data can be read in a random access manner; means we can store and retrieve data in any order rather than sequentially. A hard device is also required for the installation of any program or files you want to keep on your computer. When we download the files, they are permanently saved on our hard disk. The cost per bit stored on the hard disk is very less compared to other storage media.

A hard disk is a magnetic storage medium for a microcomputer. A computer's hard drive consists of, various disks with read/write heads, a driver motor (used to spin the disks), and a small amount of circuitry which is sealed with a metal case to protect the disks from dust.

The hard disk drives are consists of four key components inside the casing:

1. **Platters**: A HDD consists circular disks called platters sealed with container which store data inside the hard disk in the form of 1s and 0s.To increase the overall capacity of the drive, several platters are used. Platter's speeds correlate with read/write rates.
2. **Spindle**: It is used to place the platters in position and rotate as it requires.
3. **Read/Write arm**: It is used to control the read /write heads. The actual work of reading/ writing arm is to convert the magnetic surface into electric current.
4. **Actuator**: It is used to control the movement of the read/write arm and transfer data to and from the platters. An actuator is responsible for ensuring the exact position of the read/write arm.

HDD Size: The hard drive is mostly capable of storing more data than any other drive, but its size can change depending on the type of drive. Older hard drives had a storage size of several 100MB to several GB. Newer hard drives have a storage size of several hundred GBs to several TBs.

Advantages of HDD: It has a Fast start up and produces very little noise. HDDs are environment friendly and produce minimum heat on working. These are lightweighted so Ideal for Laptops. As compared to other drives HDDs consume less power.

Solid State Drives (SSDs): Modern computers are now using solid-state drives as the primary storage device, rather than HDD. HDDs are very slow as compare to SSDs, for reading and writing data. SSDs are replacing HDDs. Now the configuration is being made in such a way that SSD is used as the master drivefor installing the operating system and other software on it, and HDD is being used as secondary storage to store documents, downloads, and audio or video files. HDDs are less expensive than SSDs. However, more and more laptops are beginning to utilize SSD over HDD, helping to improve the reliability and stability of laptops.

Comparison between HDD and SSD

1. SSD and HDD both are Hard Disk Drive
2. SSD has high read/write performance for random and sequential data retrieval as compared to HDD.
3. SSD is now more popular as compared to HDD in desktops and Laptops.
4. SSD uses the newest way to read/write data using tacking chips in a grid whereas HDD uses magnetic properties to read/write data. Thus HDD has a frequent mechanical breakdown as compare to SSD.

5. SSD generates little to no noise and HDD can sometimes be one of the loudest components in a computer.

Various components of HDDs and SSDs are depicted in Fig. 1.25.

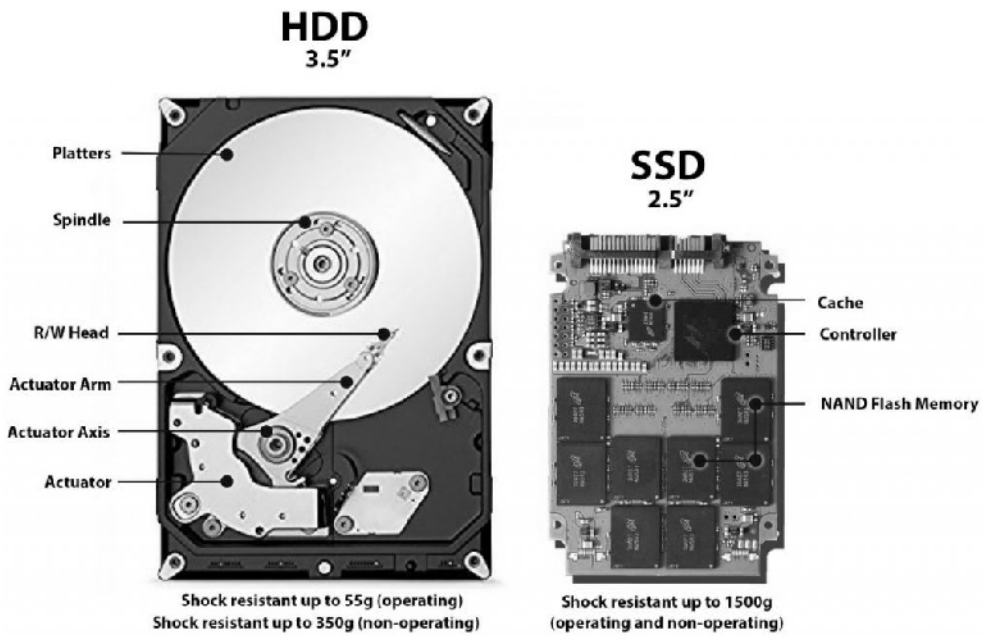


Fig. 1.25: Parts of HDDs and SSDs

1.13 OTHER PERIPHERAL DEVICES

A peripheral device also called an auxiliary device is any connected device that provides a computer with additional features. Usually, the word peripheral is used to refer to a device external to the computer case, like a scanner, but the devices located inside the computer case are also technically peripherals. Peripheral is commonly divided into three kinds input device, output device, storage device. Let us understand various peripherals devices:

1.13.1 Input Devices

These are used to send data or commands to the computer system. Some commonly used devices are mouse, keyboard,scanner,barcode reader, webcam, microphone, Digital Camera, Light pen, joystick, stylus Graphic tablet, Touch screen. Some popular input devices are discussed and depicted in Fig. 1.26 & 1.27.

1. **Scanner:** Scanner is an input device that is used for direct data entry from the source document into the computer system. It converts document image into digital form and saves into the computer for future prospect.
2. **Bar Code Reader:** Barcode reader or barcode scanner is an optical device (scanner) that is used to read barcodes in the form of lines, decode the information contained in the barcode and send the information to a computer. It is being used commonly for automated, fast and reliable data entry operations. We can see its usage in the shopping market to track the price

of goods, tracking parcelor postage, or in libraries where each book hasa bar code to uniquely identify its details.

3. **Webcam**: It is used to capture image and video and convert it into digital form. It has no inbuilt memory so they require computer storage to save captured data.

Fig. 1.26: Input Devices (a) Scanner (b) Barcode Reader (c) Webcam

4. **Microphone**: It is a voice input device that allows users to input audio into the computer system. It is used in a computer system for taking audio input for its various applications like online chatting, computer gaming, voice recording, voice recognition and many more.
5. **Digital Camera**: It is used to take pictures digitally. It allows the user to store the captured media files (audio, video) in a memory card and transfer them to a computer. Digital cameras have become very popular and inexpensive in recent years.
6. **Light Pen**: It looks like a pen. It is light sensitive device, made up of photocells and an optical system in a small tube. It is mainly used to select items on the computer screen, for drawing pictures and writing directly in a document file using a computer screen.
7. **Joystick**: It is generally used to play games conveniently on the computer or other gaming device. It controls the objects, players and vehicles of the computer game.

Fig. 1.27: Input Devices (a) Microphone (b) Digital Camera (c) Joystick

8. **Graphic Tablet**: It is also known as a digitizer. It is used to convert hand-drawn artwork into digital file formats e.g. png, jpeg, etc. Users use the stylus to draw graphics on a surface as we draw on paper using a pen or pencil.
9. **Stylus**: Using this device we can draw or write on the digitizer's surface and touchscreen.
10. **Touch screen**: Widely used for portable devices such as smartphones, tablets, laptops, notebooks. It allows users to input via gestures of hand or stylus.

TYPE: Use of ICT (A Webpage) **Title:** Pointing Device Gesture

1.13.2 Output Devices

It provides processed data saved on the computer as output to the users. Some output devices are monitors, projector, printers, speakers, Braille readers, plotters, Television, video card, sound card Radio. We have discussed the primary output device i.e. monitor in our earlier section. Now let us understand some others output devices.

1. **Projector**: It is an output device that projects an image, video onto a large surface, like a white screen or wall.
2. **Printer**: It is an output external hardware device that takes the electronic data or information on a computer or any other device and converts it into a hard copy. In other words, a printer is an output device that prints a paper document that includes text, images, or a combination of both.The printer output is called a hard copy, as it is a physical form of an electronic document.The quality of a printer depends on various factors like printing color, resolution, speed, etc.

Nowadays two types of printers are mostly used, inkjet and laser printers. Types of printers are depicted in Fig. 1.28. Dot-matrix and daisy wheel printers are impact printers which print single character at a time whereas drum, chain and band printer prints complete line. Above discussed printers were impact printers that use mechanical moving components for printing. In the case of a nonimpact printer, there is no mechanical moving component used. Inkjet, laser and thermal printers lie in this category. Inkjet printers are commonly used by consumers or suppliers, while laser printers are used by the businesses world, where they require high resolution or highspeed printing. Dotmatrix printers, which have become increasingly rare but are still used for basic text printing. Dot-matrix printer speed and resolution are less as compare to laser printer.

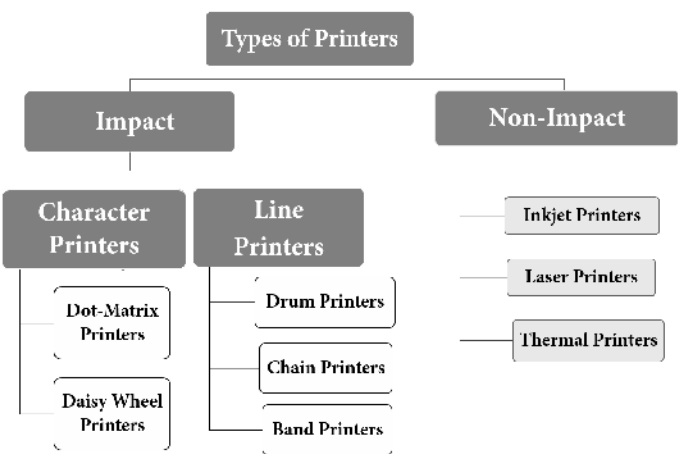


Fig. 1.28: Classification of Printers

3. **Speaker**: A computer speaker is the primary output device for audio output. It is hardware devices that convert a computer's sound card signals into audio form. It was coming as separate external hardware in PCs but now in laptops and modern PCs it is coming as an onboard preassembled unit
4. **Braille Reader**: It is a peripheral device that is mainly used for a blind person to read text displayed on a computer screen. Braille readers are also called braille displays it is a separate device as a part of the keyboard.

5. **Plotter**: It is similar to printers but was used to produce vector graphics drawings. It uses various writing tools (e.g. pencil, pen, marker, etc.) instead of toner for printing. A conventional printer draws series of dots whereas a plotter device draws multiple, continuous lines onto paper.
6. **Graphics card**: It is an expansion card that attaches to the slot residing on the motherboard. It is used to process the images and videos and enables higher resolution graphics to rapidly visualize on a display screen.
7. **Sound Card**: It controls the output of sound signals, which enable speaker and headphones to work.

1.13.3 Storage Devices

It stores data processed by the computer. Hard disk drives, flash drives like pen drives or memory cards, floppy disks, optical storage like CD/DVD, all such storages lie in storage device category.

SUMMARY

1. The proliferation of internet services requires basic internet skills.
2. Browsers are user agents to send and receive information on the internet.
3. Search engines are powerful tools to retrieve desired information in minimal time.
4. Good governance by e-Governance is achieved by the digital India program. It aims to provide minimal government and maximum governance.
5. Computer hardware is various physical (tangible) components of computers.
6. The CPU consists of ALU, Control Unit and Memory storage unit.
7. The ALU can be called the brain of the computer without it the computer would be more or less useless.
8. Input and Output devices are essential components of a computer system.
9. Primary memory is called a temporary or volatile memory as whatever data or instructions are stored in it, remain till power is ON.
10. Secondary memory is mainly used to store data permanently and is also known as nonvolatile memory.
11. A Computer monitor is simply the screen that will present you digital output from the computer. Various type of monitors are CRT, TFT, LCD, LED, Plasma, etc.
12. The keyboard is used to type letters, numbers, symbols, and send instructions to a computer.
13. The printer is an output device that prints document having text, images, or a combination of both. The output of the printer is called a hard copy.
14. HDD is a nonvolatile memory used to store operating systems files, application problems, media and other documents.
15. Peripheral devices can be input/output, internal or external.

EXERCISES

A. Objective Questions

Q1. Which one is not an example of the web browser?

A. Yandex
B. Microsoft Edge
C. Safari
D. Opera

Q2. A light sensitive device that converts drawing, printing text, or other images into digital form is
A. Plotter B. Scanner
C. Keyboard D. OMR

Q3. Which is an example of a pointing device?
A. Pointer B. Joystick
C. HDMI D. Cursor

Q4. Which of the following computer input device enable video conference?
A. Monitor B. Digital Camera
C. Voice recognition D. Webcam

Q5. A Central Processing Unit (CPU) contains
A. An analytical engine and a card reader. B. An arithmetic/logical unit and input devices.
C. A control and arithmetic/logical unit. D. A control unit, and input/ output devices.

Q6. Which one is part of Digital India Portals under the Infrastructure Category?
A. IRCTC CONNECT B. SWAYAM
C. MYGOV D. BHIM

Q7. Portal of India that provides the facility to take online courses (MOOCs)
A. E-PATHSHALA B. PMGDISHA
C. SWAYAM D. SHAALA DARPAN

Q8. The main memory of a computer is
A. External B. Internal
C. Auxiliary D. None of these

Q9. One Kilobyte is equal to?
A. 1020 bytes B. 1026 bytes
C. 1024 bytes D. 1022 byte

Q10. What does HDD stand for
A. Hard Disk Device B. Hard Disk Drone
C. Hard Disk Data D. Hard Disk Drive

B. Subjective Questions

Q1. What is a web browser? Discuss common features of a web browser.

Q2. How does a Search Engine work? Explain its searching process.

Q3. What is DigiLocker? Explain its features.

Q4. Explain types of printers.

Q5. Write a Google search query to get:
a. official websites of the Government of India.
b. web results available under the name "India New Education Policy", get web results with pdf file.
c. web results that give information about laptops in the range of Rs 25000 to Rs 35000. These results should come from the website of an anyone e-commerce company and should include laptops of the desired brand.

C. Online Quiz

TYPE: Use of ICT (An Online Quiz) **Title:** Search Better

ANSWERS

A. Objective Questions

Q.N .	1	2	3	4	5	6	7	8	9	10
Option	A	B	B	D	C	A	C	B	C	D

B. Hints for Subjective Questions

A1. A web browser is a client side program for browsing the internet for various purposes. Define its features like bookmarking, tabbed browsing, password & download management, private browsing, Ad blocking, Incremental search etc.

A2. A search query will fetch results based on inputted keywords but this process also depends on the crawling, indexing and ranking mechanism of a search engine.

A3. DigiLocker is a Government of India initiative under Digital India. Its secure cloud-based platform for issuance and verification of documents and certificates.

A4. The printer is an output device that prints an electronic document onto physical paper. The documents may include text, images or a combination of both. Printers are categorized into impact and nonimpact types, based on printing technology.

A5. Search queries may be:

a. site:.gov.in orsite:.nic.in or site:(.gov.in | .nic.in)

b. "India New Education Policy" filetype:pdf

c. laptop 25000..35000 +HP +DELL site:flipkart.com

KNOW MORE

Applications

In current digital era, Internet & computer is used abundantly in many sectors as we discussed in section 1.1.2. In addition, there are some other applications e.g., maintaining patient database in hospitals, online examinations in education, accounting and managing inventories in business, analysing investment, sales, expenses in business, Interior Designing, X-Rays processing, military, country's defence mechanism, nuclear plants, research and development, topographic images, plotting geographical data etc.

PRACTICALS

Experiment 1.1: Browsing and Searching

Practical Statement

Browser features, browsing, using various search engines, writing search queries.

Practical Significance

In the world of the internet, there are more consumers of information than the producer. The principle is also propounded by the ISP's data allocation patterns. Higher bandwidth is offered for data downloading than for uploading. Web browsers are user agents to search the available information on www. The process of information retrieval while navigating from one page to another through hyperlinks is termed browsing. Browsing & searching on the internet are now an integral part of day-to-day computing.

Search engines can also be leveraged to get relevant results based on given search terms. It is very much relevant to acquire skills needed to effectively browse the internet to fetch the most relevant information from the ocean of information i.e., www.

Relevant Theory

The browser helps us to perform convenient browsing using its user interface and features (refer to unit 1 section 1.2, page 9). Search engines, types of web searches, and their working is elaborated in the theory part of this book (refer to unit 1 section 1.3, page 12-16). The search engines also provide a graphical user interface to find scrutinized valuable results (refer to unit 1, Fig. 1.11 & Fig. 1.12).

A detailed list of search symbols, operators, and commands is also mentioned in unit 1 (Table 1.2, page 14). We have to execute the queries specified in the table one by one and observe the results. Learners are suggested to write new queries too, we just took two queries and their explanations.

Practical Outcomes (PrO)

The learners will be able to:

PrO1: use different features of web browsers.

PrO2: browse the world wide web in a convenient manner.

PrO3: acquainted with web interfaces of search engines and use different search engines.

PrO4: fetch the most relevant search engine result pages by writing effective search queries.

Practical Setup (Work Situation)

1. Learns have to find any fixed search query of their interest (like mine "nep 2020") on various web browsers on a particular search engine and analyze the search results.
2. Learners have to use the features of web browsers for convenient browsing and searching.
3. Learns have to find the search query (as of step 1) on various search engines with a fixed browser and analyze the search results.
4. Refine your search results by search engines interface or by writing queries.

Resources Required

1. A computer system i.e., any PC/Laptop/Tablet/Smartphone.
2. An internet connection.
3. An installed web browser software i.e., Mozilla Firefox, Google Chrome, Microsoft Edge, etc.
4. Access to various search engine websites (i.e., google.com, yahoo.com, duckduckgo.com, bing.com, yandex.com, etc.) or installed browser extensions of your preferred search engine.

Precautions

1. Use an updated web browser to protect from security breaches and browser vulnerabilities.
2. Browse valid search engine websites with HTTPS& enabled padlock icon in the address bar.
3. Download extensions from authenticated app stores and verified vendors.
4. Follow information security best practices (refer to unit 5, section 5.4.1 & 5.4.2).

Suggested Procedure

Browsers have some commons features like bookmarking, download management, password management, tabbed browsing, Incremental search,etc. these are explained in unit 1, page 9. One important feature Ad blocking is discussed here.

(a) Ad blocking On Chrome browser

1. Open Chrome browser and Click, Settings and more (ellipsis icon (three horizontal dots)) in the upper-right corner of the browser or Press Alt +F. A dropdown menu will be present.
2. Click on Settings.
3. In the next window that opens, click on the "privacy and security" option on the left pane.
4. Under "Privacy and security" options at right pane "select Site settings"
5. A new window with long lists of site settings will be presented. Under content select "Pop-ups and redirects" then enable radio button having caption "Don't allow sites to send pop-ups or use redirects"

   Learners are advised to check out how to blocks popups in other browsers. Do it practically too.

(b) Searching on various web browsers on a particular search engine:

1. Open Mozilla Firefox web browser and go to google search engine website i.e., www.google.com
2. Insert any of your favorite search terms (like "nep 2020") in the search bar (or even in the address bar if it is set as your default search engine for the browser) and then press the "Enter key" or tap on lens button if you are using mobile/tablet.
3. Several result pages (SERPs) will be presented. Customize this result to show only image types results. Click on the "images" button below the search bar (refer to unit 1, Fig. 1.11).
4. Various images related to the search term will be presented. Click on the first image. It will show a new pane with the image enlarged.
5. Right-click on the image → copy link address. Save this address in a text document (notepad) so that it can be reused for our observation Table 1.7.
6. Perform steps 4 & 5 for all three image results and parallelly update the observation Table 1.7.
7. Follow Table 1.7 for browser and search engine selection and update observations accordingly.

(c) Writing search queries

1. Open google chrome web browser and open google search engine website i.e., www.google.com
2. Retype the previously given search term(like "nep 2020") with the different search operators (refer to unit 1, Table 1.2). Update the results in the observation table by using the search operator one after the other and in combination. An example is also listed in Table 1.8.

Observations

Table 1.7: Browsing Results for Search Term "nep 2020"

Sr. No	Browser	Search Engine	Results		
			# of results and time taken	URL of first 3 Image results	URL of first 3 Image results after applying any filter (i.e., size, color, type, time etc.)
1	Mozilla Firefox	google.com	4,10,00,000 (0.57 seconds)	1	1
				2	2
				3	3
2	Microsoft Edge	google.com			
3	Google Chrome	google.com			
4	Google Chrome	yahoo.com			
5	Google Chrome	duckduckgo.com			
6	Google Chrome	bing.com			
7	Google Chrome	yandex.com			

Table 1.8: Search Queries

Sr. No	Search Query on google.com	Results		
		# of results and time taken	URLs of the first 3 results	Screen Shot of the First page of SERP
1	nep 2020 filetype:ppt		1	
			2	
			3	
2	nep 2020 filetype:pdf site:(gov.in | nic.in)		1	

Results and Interpretation

1. "nep 2020" search query requested by Mozilla Firefox, Microsoft Edge & Google Chrome fetches the same number of results in variable time.
2. "nep 2020" search query requested by Google chrome browser for different search engines fetch the different number of search results with a different ranking.
3. Search query fetches reliable and useful content about the "nep 2020" search term. It fetches only PowerPoint presentations in the first query of Table 1.8.
4. Second query fetches confined results of portable document format from government websites i.e.,, gov.in or nic.in

Conclusions

1. The same search query requested by different web browsers fetches some different results even on the same search engine. Which is likely due to browser settings, cookies, etc.
2. The search results of different search engines vary drastically.
3. The different browser has their interfaces to perform browsing & searching tasks.
4. Web results are dynamic depends on various factors like internet speed, time of day, search traffic on that between request machine and server, etc.

Practical Related Questions

Note: Below given are few sample questions for reference. Teachers must design moresuch questions in order to ensure the achievement of pre-defined course outcomes.

1. Have you found any suggestions during search term typing?
2. What difference you observed in first three results (s.no 1 to 3) of Table 1.7?
3. Why does ":url" and ":intext" used for?
4. Which operator is used to group search terms in Google's search query?

Suggested Learning Resources

[1] A. Ravichandran, *Internet and Web Technology*. New Delhi: Khanna publishing house.

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment regarding process and product-related marks.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Environment Readiness by student	10	
2.	Explanation of practical components i.e., section 1.2 to 1.7	20	
3.	Procedure adoption and step-by-step explanation	10	
4.	Viva voce	10	
Product Related: ..... Marks* (.....%)			
5.	Preparation of observation tables	25	
6.	Screen shots and explanation of Observation tables & conclusions made	25	
	Total	**100%**	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... **Marks Awarded**			**Signature of Teacher with date**
Process Related	Product Related	Total	

Experiment 1.2: Digital India Portals

Practical Statement

Visit various e-governance/Digital India portals, understand their features, services offered.

Practical Significance

The Digital India program has become a unique example of the world in providing various public welfare services to its citizens through digital technology. The practical will not only teach the students to browse the internet but will also promote the above services to the masses through the students.

Relevant Theory

Digital India program with its key vision area and pillars is explained in the theory part of this book (refer to unit 1, section 1.4). A detailed categorized list of important portals is also mentioned in the unit 1 (refer to unit 1, Table 1.3).

Practical Outcomes (PrO)

The learners will be able to:

PrO1: browse various Digital India portals.

PrO2: analyze key services and features of the portals.

Practical Setup (Work Situation)

In the practical, we will browse www.uidai.gov.in, swayam.gov.in, and mygov.in Digital India portals one each from infrastructure, service based, and empowerment category respectively.

Resources Required

1. A computer system i.e., any PC/Laptop/Tablet/Smartphone.
2. An internet connection.
3. An installed web browser software i.e., Mozilla Firefox, Google Chrome, Microsoft Edge, etc.

Precautions

1. Use an updated web browser to protect from security breaches and browser vulnerabilities.
2. Browse only valid websites with HTTPS and padlock-enabled icon in the address bar.
3. Follow information security best practices (refer to unit 5, section 5.4.1 & 5.4.2)

Suggested Procedure

1. Open any web browser of your choice.
2. Type URL www.https://uidai.gov.in into the address bar of the browser.
3. The home page of the above web portal will be shown as depicted below:

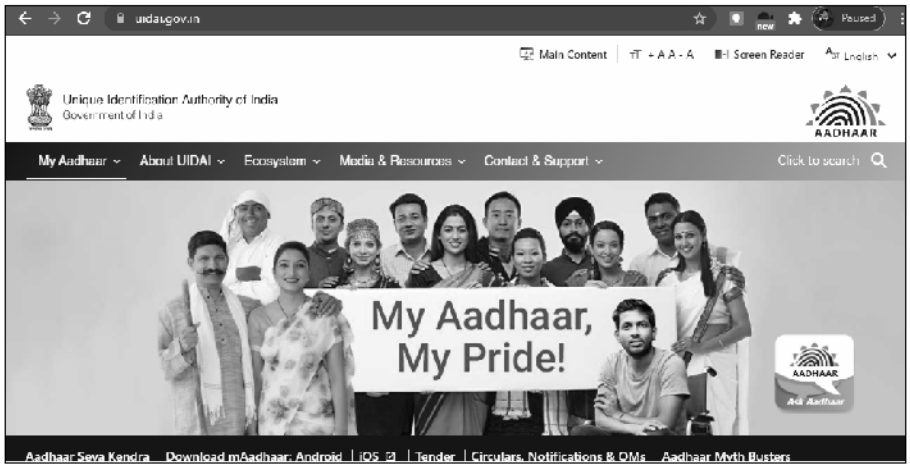


Fig. 1.29: Home Page of UIDAI.GOV.IN Portal

4. The home page has a menu bar on the page with various menus titled My Aadhaar, About UIDAI, Ecosystem, Media & Resources, and Contact & Support. Placing mouse pointer to these menus will change the existing cursor from an arrow to pointing hand shape pointer.
5. Open the first menu by hovering over the mouse pointer. The Dropdown menu will show various options as shown in Fig. 1.30. These are various services that can be availed with this Digital India portal.

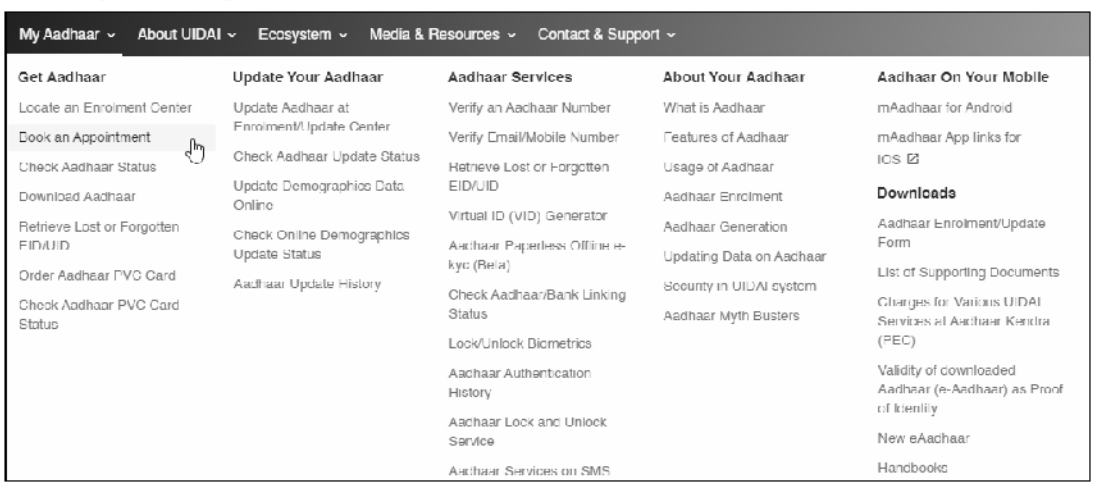


Fig. 1.30: My Aadhaar Menu Showing Various Services

6. By navigating various menus other related information will be shown. Update Table 1.9 for various features and services offered by *uidai.gov.in*.
7. Similarly, by following the above procedure *swayam.gov.in* & *mygov.in* portals can be browsed and analyzed. The home pages of these portals are depicted in Fig. 1.31 & Fig. 1.32.
8. A click on "EXPLORE COURSES" at the Swayam portal provides a list of upcoming and ongoing MOOCs for Indian citizens.
9. MyGov portal provides a facility for citizens to participate in government decisions.

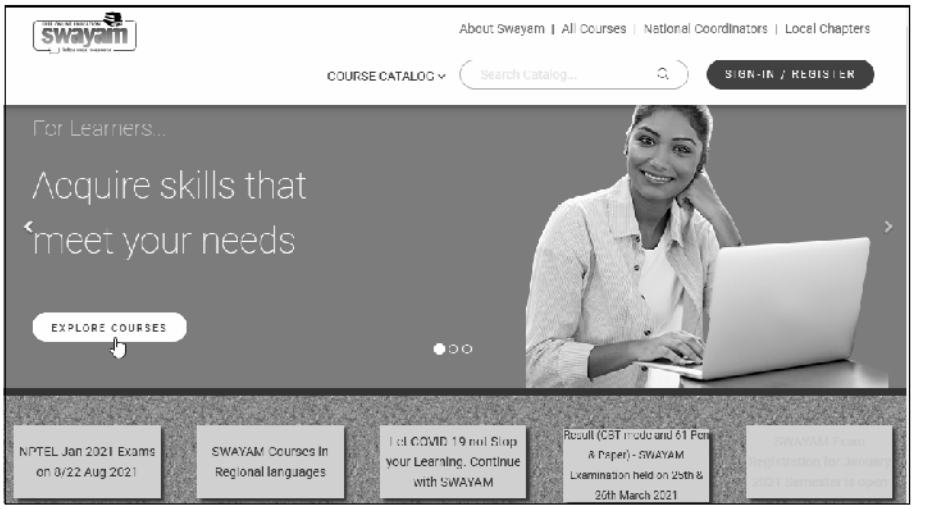


Fig. 1.31: Home Page of Swayam Portal

Fig. 1.32: Home Page of MyGov Portal

Observations

Table 1.9: Key Services and Features of e-governance/Digital India Portals

Sr. No.	Digital India Portal	Key Services Offered	Features
1	www.uidai.gov.in	Book appointment, Check status, etc.	Multilingual, Screen Reader, customizable fonts size, chat-bot, social media feeds.
2	www.swayam.gov.in		
3	www.mygov.in		

* Enlarge the last two columns to accommodate features and services offered by portals.

Results and Interpretation

1. UIDAI's portal is robust in terms of offered services and the use of technology in portalcreation. It offers Aadhaar related services from creation to maintenance.

2. Swayam MOOC platform has the capability of a complete online education portal. It provides an online facility to enroll, deliver content, and managing student's exams and credit details.
3. MyGov portal envisages citizen's role in government decision-making. The concept of participatory government is achieved via various Groups, Discussions, Polls, Blogs, and Talks.

Practical Related Questions

Note: Below given are few sample questions for reference.

1. Is it possible to download an electronic copy of your Aadhaar?
2. Name three activities you can participate in on the MyGov portal.
3. Which course you can join on Swayam? can it be linked to your current board/university?

Suggested Learning Resources

[1] "Digitalindia | Digital India Programme | Ministry of Electronics & Information Technology(MeitY) Government of India," *www.digitalindia.gov.in*. http://www.digitalindia.gov.in (accessed Aug. 19, 2021).

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment regarding the process and product-related marks.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Environment Readiness by student	10	
2.	Explanation of practical components i.e., section 1.2 to 1.7	20	
3.	Procedure adoption and step-by-step explanation	10	
4.	Viva voce	10	
Product Related: ..... Marks* (.....%)			
5.	Preparation of observation tables	25	
6.	Explanation of observation tables & interpretation made	25	
	Total	**100%**	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... **Marks Awarded**			**Signature of Teacher with date**
Process Related	Product Related	Total	

Experiment 1.3: Computer Hardware Components

Practical Statement

Read Wikipedia pages on computer hardware components, look at those components in the lab, identify them, recognize various ports/interfaces and related cables, etc.

Practical Significance

The usefulness of the computer is proved by its ubiquity. The maintenance needs of such ubiquitous equipment cannot be ignored. Identifying various hardware components, connecting them, and correcting common errors has now become an essential general skill.

Relevant Theory

A computer system, its various parts, input-output devices are explained in detail in sections 1.8 to 1.13 of the first unit. Different ports briefly described below.

Computer port: Is a connector on the motherboard or on a separate adapter that allows a device to connect to a computer; these may include keyboard, mouse, serial, parallel, network, sound, or video ports. Ports vary with the type of equipment that connects to the ports.

Male ports: Have pins that protrude out from the connector and require a cable with a female connector.

Female ports: Have holes in the connector to accept the male cable's pins.

PS/2: Most desktop computers have two of these round ports for six pin connectors, one for the mouse and one for the keyboard.

USB: It is a 4-wire connector type of port. It has different models (USB 1.0, USB 2.0, and USB 3.0). In modern computers connects all kinds of external USB devices e.g., external hard disk, printer, scanner, mouse, keyboard, etc. Data travels at 12 megabits persecond. USB compliant devices can get power from a USB port.

Serial Port: These connectors use pin connectors of D type. Generally used for long distance communication. Also known as a COM port. Data travels at 115 kilobits per second.

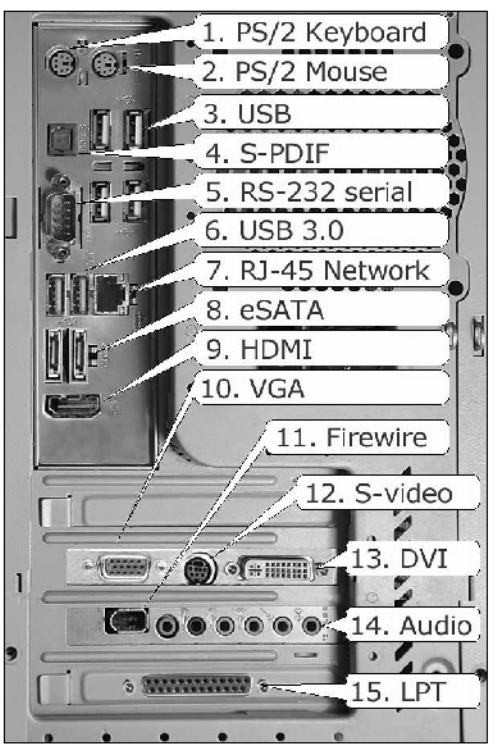


Fig. 1.33: Computer Rear Pannel Connectors
view image source : https://pinouts.ru/comp.php

Ethernet Port: Connects to a network and high speed Internet. Connect the network cable to a computer.This port resides on an Ethernet Card. Data travels at 10 megabits to 1000 megabits per second depending upon the network bandwidth.

HDMI: High Definition Multimedia Interface provides an interface between any audio/video source, e.g., DVD player, or A/V receiver, and an audio and/or video monitor, such as a digital television (DTV). HDMI supports standard, enhanced, or high-definition video, plus multi channel digital audio on a single cable.

VGA: A three row, 15-pin female D-shell connector for newer VGA, SVGA, XGA, SXGA, or UXGA monitors. Connects monitor to a computer's video card. Similar to the serial port connector but serial port connector has pins, it has holes.

FireWire: is a personal computer/consumer electronic serial bus interface standard offering high-speed communications and isochronous real-time data services. Often implemented in consumer electronics devices, digital video cameras, VCRs, some other multimedia hardware, and computers.

S-video: connector widely used on ATI and other graphics cards. Carry s-video and composite signals.

DVI: The Digital Visual Interface (DVI) is a video interface standard designed to maximize the visual quality of digital display devices such as flat panel LCD computer displays and digital projectors.

ECP Parallel LPT port: The Extended Capabilities port is found in some old PCs. ECP is an extension of the EPP design.

Practical Outcomes (PrO)

The learners will be able to:

PrO1: browse Wikipedia web pages developed in various languages.

PrO2: convert Wikipedia pages into other languages.

PrO3: identify various hardware components of the computer system.

PrO4: recognize ports/interfaces and cables of the computer system.

Practical Setup (Work Situation)

In this practical, we will browse www.wikipedia.org an online, multilingual free encyclopedia to find several web pages related to computer hardware components. Thereafter a computer system should be disassembled and each component will be identified and categorized in a prescribed table according to its functionality.

Resources Required

1. A computer system i.e., PC/Laptop.
2. An internet connection.
3. An installed web browser software i.e., Mozilla Firefox, Google Chrome, Microsoft Edge, etc.

Precautions

1. Follow information security best practices (refer to unit 5, section 5.4.1 & 5.4.2)
2. During touching the computer system's components an anti-static mat or anti-static wrist strap and mat combination should be used to protect against Electrostatic Discharge (ESD).

Suggested Procedure

(a) Browse Wikipedia pages on computer hardware

1. Open any web browser of your choice.
2. Type URL www.https://wikipedia.orginto the address bar of the browser.

3. The home page of Wikipedia encyclopedia will appear having a search bar.
4. Type search term to find related wiki pages. In our case I have typed "computer hardware component" and during typing a suggestion list also appeared. Suggestion list with a pointing hand shape pointer on first suggestion is depicted in Fig. 1.34.
5. Either click on the lens button (search) or press enter or select any relevant suggested wiki page. As shown, the mouse pointer is hovering on the first suggestion.
6. A web page related to a given term will be presented. As we got web page depicted in Fig. 1.35.

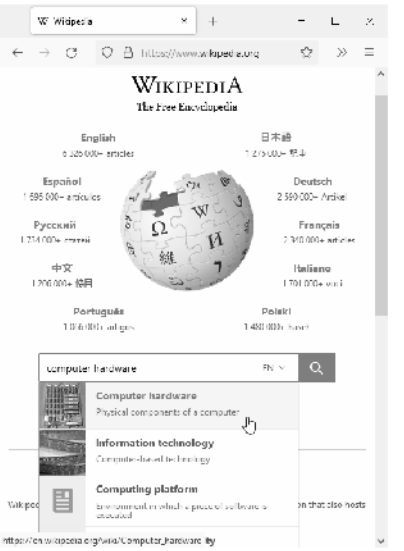


Fig. 1.34: Wikipedia.org Home Page

Fig. 1.35: Wikipedia Page on "Computer hardware"

7. The Wikipedia page has a famous layout having a basic definition or introductory information on the top and thereafter a managed list of contents included for the webpage. The "Contents" section contains local links referring to other sections of the page.
8. The page contains various hyperlinks to other related webpages of Wikipedia and links to references for the page.

9. Navigate to other links one by one to get more related information. e.g., we can browse other Wikipedia pages on the CPU, monitor, mouse, etc. by hyperlinks on the first paragraph.
10. For a fresh search, use upper right corner search box with a lens icon.
11. We can view Wikipedia pages already developed in other languages by scrolling down to the Languages section in the left pane as shown in Fig. 1.36. It is not about being a consumer only, we can contribute by writing a page to Wikipedia. You may follow the instructions given in the "Contribute" section for the same.

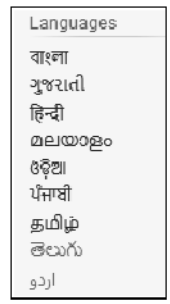


Fig. 1.36: Wikipedia Pages in Other Language

12. To view an enriched wiki page (developed in any language) to your preferred regional language you may use some browser extension to completely translator the webpage in your desired language.
13. As you can see the Fig. 1.37 presents the same webpage (having the previous URL) translated into Hindi language.
14. The webpage can be translated into other languages with the toolbar (available after installing and enabling the google translate extension) on the top of the webpage.

Fig. 1.37: Wikipedia Page Translated in Hindi

(b) Recognise various components, ports, and cables

1. Look at all those wires coming from the back of your PC. There's a power cable, a telephone or network cable, probably a printer cable, a keyboard cable, a mouse cable, and maybe a few others, depending on your system. Various components should be enlisted in form of Table 1.10.
2. Explain in detail the components included in Table 1.10 such as their purpose, manufacturing companies, estimated value etc.
3. Unplug each of your PC's cables one at a time and practice plugging it back in until you get a feel for how it fits.
4. Properly reconnect all the cables that you removed.
5. Examine other computers to see if they have different connectors from the ones, you've already documented.

Observations

Table 1.10: Recognised Hardware Components

Sr. No	Input	Output	Processing	Storage

Practical Related Questions

Note: Below given are few sample questions for reference.

1. What is the way to view a Wikipedia page in regional languages?
2. Explain in detail about the components given in the table, such as the names of the manufactures of the components, their purpose, estimated price, etc.
3. Is it possible to plug any cable into the wrong connector? If so, which one(s)?
4. Data cable from the keyboard to the PC
   Type of connector: _____ ; Male or Female: _____; Number of pins/holes: _____
5. Describe the data cable connector type at both endsfrom scanner to computer.
6. Identify the connectors pictured next. What is the name of each connector and what does it connect to?

Suggested Learning Resources

[1] D. Anfinson and D. Quammen, *IT Essentials PC Hardware and Software Companion Guide.* Madrid: CISC Press.Pearson Education., 2009.

[2] M. Meyers, *Mike Meyers' CompTIA A+ guide : essentials : exam 220-701.* New York: Mcgraw-Hill, 2010.

[3] "Computer Rear Panel Connectors pinouts diagrams @ pinouts.ru," *pinouts.ru.* https://pinouts.ru/comp.php (accessed Sep. 19, 2021).

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment regarding process and product related marks.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Environment Readiness by student	10	
2.	Explanation of practical components i.e., section 1.2 to 1.7	20	
3.	Procedure adoption and step-by-step explanation	10	
4.	Viva voce	10	

Product Related: ..... Marks* (.....%)			
5.	Preparation of observation tables	25	
6.	Explanation of observation tables & interpretation made	25	
	Total	**100%**	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... Marks Awarded			Signature of Teacher with date
Process Related	Product Related	Total	

Experiment 1.4: Peripherals and Device Driver Installation

Practical Statement

Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.

Practical Significance

It is a well known fact that hardware components from different manufacturers are assembled to make a complete computer system. Although operating systems are equipped to install a large list of standard hardware. But some hardware devices are not automatically installed during the operating system installation and some don't work properly post-installation. Further, the capability of the driver is updated from time to time by the hardware manufacturers. Thus, it is essential to be versed with the skills required for driver installation.

Relevant Theory

(a) Connect Peripheral devices

Computers are all about input and output, both within the system box and between the system box and a variety of external devices. The term input/output (I/O) covers both types of these interactions. Examples of common input devices include the keyboard and any pointing device (mouse, trackball, pen, etc.). Data can also be input from devices that also take the output, such as storage devices and network cards. The most common output devices are the display, sound card, and printer.

(b) Device driver installation

Device Manager is the primary Windows tool for managing hardware. It lists all installed hardware devices and the drivers they use. Using Device Manager, you can disable or enable a device, update its drivers, uninstall a device, and undo a driver update. Device manager can be accessed via any of the below methods.

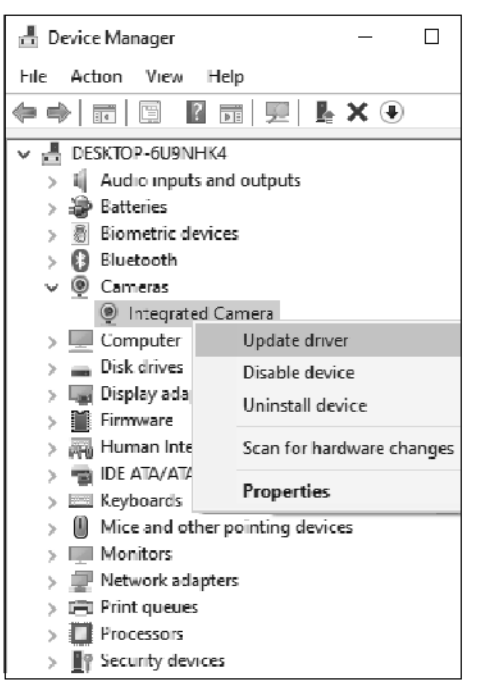


Fig. 1.38: Device Manager Program

Start menu: The easiest way to open the Device Manager on Windows 10 is to click on the Start menu and type 'Device Manager' in the search box.

Run: Press the Windows key with the letter R (Windows Key + R) where the Run engine will appear. Type in 'devmgmt.msc' and click OK. The device manager window will be shown as depicted in Fig. 1.38.

Practical Outcomes (PrO)

The learners will be able to:

PrO1: connect various peripherals to the computer system.
PrO2: explore various features of peripherals.
PrO3: install the device drivers of hardware.

Practical Setup (Work Situation)

This practical will discuss a universal method for device driver installation and a specific method for local scanner/printer installation.

Resources Required

1. A computer system i.e., PC/Laptop.
2. An internet connection.

Precautions

You must log on with administrator privilege to make any changes via device manager.

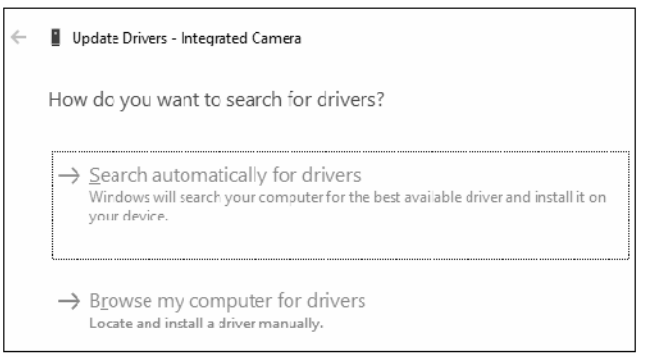


Fig. 1.39: Update Drivers Window

Suggested Procedure

Follow these steps to use Device Manager to update device drivers of your system.

1. For best results, locate and download the latest driver files from the manufacturer's website to your hard drive. Be sure to use 64-bit drivers for a 64-bit OS and 32-bit drivers for a 32-bit OS.
2. Using Device Manager, right-click the device and select Properties from the shortcut menu (See Fig. 1.38). The Properties window for that device appears. Select the Driver tab and click Update Driver. The Update Driver Software box opens (See Fig. 1.39).
3. To search the Internet for drivers, click Search automatically for updated driver software. If you have already downloaded drivers to your PC, click Browse my computer for driver software, and point to the downloaded files. Note that Windows is looking for a .inf file to identify the drivers. Continue to follow the directions on the screen to complete the installation.

Install or add a local scanner/printer on Windows 10

In most cases, all you have to do to set up a scanner is to connect it to your device. Plug the USB cable from your scanner into an available USB port on your device, and turn the scanner on. If that doesn't work, here's a way to do it manually.

1. Select Start → Settings → Devices → Printers & scanners.
2. Select Add a printer or scanner. Wait for it to find nearby scanners/printers, then choose the one you want to use and select Add device.

Observations

Table 1.11: Administering Hardware with Device Manager

Sr. No	Action taken	Reflection in Device Manager	Screenshot
1.	Install, update, disable or uninstall	Current version no. and new version no of drivers in case of install and update.	

Practical Related Questions

1. Name some peripheral devices used for output purposes.
2. Which Windows utility is used to install or update device drivers?

Suggested Learning Resources

[1] D. Anfinson and D. Quammen, *IT Essentials PC Hardware and Software Companion Guide.* Madrid: CISC Press.Pearson Education., 2009.

[2] M. Meyers, *Mike Meyers' CompTIA A+ guide : essentials : exam 220-701.* New York: Mcgraw-Hill, 2010.

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Explanation of practical components i.e., section 1.2 to 1.7	20	
2.	Procedure adoption and step-by-step explanation	15	
3.	Viva voce	15	
Process Related: ..... Marks* (.....%)			
4.	Preparation of observation tables	25	
5.	Explanation of observation tables & interpretation made	25	
	Total	100%	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... Marks Awarded			Signature of Teacher with date
Process Related	Product Related	Total	

REFERENCES AND SUGGESTED READINGS

[1] R. S. Salaria, *Computer Fundamentals.* Khanna publishing house.

[2] P. K. Sinha, *Computer Fundamentals*, 6th ed. New Delhi: Bpb Publication,2019.

[3] "Digitalindia | Digital India Programme | Ministry of Electronics & information Technology (MeitY) Government of India." https://digitalindia.gov.in/ (accessed Jul. 15, 2021).

❑❑❑

2 Operating Systems

UNIT SPECIFICS

This unit provides step by step guide to install Windows and Linux operating systems. The unix shell types and commands are also elaborated with suitable examples. Unit also covers popular visual editor of Linux system with its various operating modes and commands. Thus, unit enables the learners to prepare their computer systems by installing desired operating system. Unit also enhances the skill set of the learners by familiarizing them to work in Linux command line environment.

RATIONALE

A computer system comprises many components like computer hardware, operating system, application programs and the end users. An operating system is a system program that provides an interface between end users and the computer hardware. It is the main program that hosts other programs. It facilitates users by making the computer environment easy to use and manages resources of a computer system. In addition, the operating system performs various other managerial tasks e.g., process management, memory management, file management, security and command interpretation. Therefore, it is very important to understand the operating system to use the computer efficiently.

PRE-REQUISITES

- Fundamentals of computer software & hardware.
- Basic word processing capabilities.

UNIT OUTCOMES

Learners will be able to:

U2-O1: Install Linux operating system i.e., Ubuntu.
U2-O2: Install MS Windows operating system i.e., Windows 10.
U2-O3: Differentiate various Unix shells.
U2-O4: Execute shell commands.
U2-O5: Work in vi editor and run shell scripts (programs).

Table 2.1: Mapping of Unit Outcomes with the Course Outcomes

Unit-2 Outcome	EXPECTED MAPPING WITH COURSE OUTCOMES *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*						
	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
U2-O1	2	1	3	3	1	2	2
U2-O2	2	2	3	3	1	2	2
U2-O3	2	1	3	2	1	1	1
U2-O4	2	1	3	2	1	1	3
U2-O5	2	2	3	2	1	1	3

Some Popular Operating System Variants

The operating system which is generally used by people can be classified into three categories: most popular Microsoft Windows operating system, open-source operating systems (Linux is most famous among open-source operating systems) and Macintosh operating system in Apple computers. Some of the most used operating systems (Fig. 2.1) are MS-Windows, Ubuntu, Mac OS, Fedora, Solaris, Free BSD, Chrome OS, CentOS, Debian, and Android.

Fig. 2.1: Some Popular Personal Computer Operating Systems

Nowadays computing is done prominently by smartphones and tablet devices other than conventional desktop PCs. Several smartphone operating systems (Fig. 2.2) are used to operate those devices. Few facts:

- The android operating system is the most popular smartphone operating system. It is made of the modified version of the Linux kernel and developed by Google. It was developed in November 2007 and the first commercial android product launched in September 2008.
- iOS is the operating system exclusively for Apple company products like iPhone, iPad and other Apple mobile devices.
- Windows 10 Mobile operating system was also used in windows smartphones but it is discontinued after October 2017.
- Similarly, Ubuntu Touch is a mobile operating system made & maintained by a non-profit volunteer group i.e. UBports community. It is a lightweight OS specially designed for mobiles and touch screen devices. Ubuntu Touch has a "desktop mode" which made it capable to function as a desktop computer.

Fig. 2.2: Some Smart Phone Operating Systems

The market share of top trending operating systems is shown in Fig. 2.3. It shows the clear dominance of the android & windows operating systems. The facts show that "computing nowadays is mobile computing".

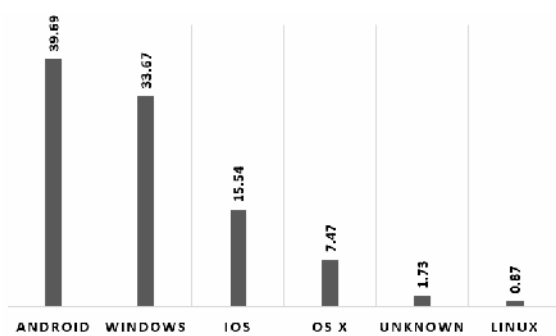


Fig. 2.3: Market Share Percentage of Operating Systems (as of June 2021)

Life is changing, similarly the digital world also changes. Trends also change over time e.g.; French police switched their operating systems from proprietary Windows OS to open-source Ubuntu, on their 80000 computers and saved 2 million euros.

Now in the coming section, we will understand to install Linux and Windows operating systems. We will install it cleanly. A clean install is a method in which all existing data and programs on a hard disk drive are over written (wiped out) and a fresh operating system is installed.

2.1 LINUX OS INSTALLATION

Linux operating system is the most popular open-source operating system around the world. It is termed Open-source because the source code of the operating system is not hidden but available to everyone. The open-source operating system has many advantages and it has a larger community for providing support.

Linux operating system invented by a resident of Finland in 1991, Linus Torvalds. Due to open-sourcecode, there are many distributions of the Linux operating system. Here we will discuss Ubuntu Linux. Ubuntu is a famous Linux distribution for desktops, servers and personal computers.

Installation of Ubuntu: A Clean Install

Before installing any operating system, it is advised to check the recommended system requirements. System requirements for Ubuntu 20.04 LTS version are described in Table 2.2

Table 2.2: Recommended System Requirements for Ubuntu 20.04 LTS

Component	Specification
Processor	2 GHz dual-core
RAM	4 GB (but 1 GB can also work)
Storage	25 GB
VGA	1024 × 768 screen resolution
Internet Access	not mandatory but it helps install updates and other programs

Step1: Download UBUNTU

- First of all, we need to download Ubuntu operating system from the official website, the link is as mentioned.
  http://www.ubuntu.com/download/desktop/ubuntu
- On the above webpage, various versions of Ubuntu OS are available. It is recommended to download the latest LTS (Long Term Support) version. In our case, we downloaded "Ubuntu 20.04.2.0 LTS". It is available in a single file i.e., an ISO file of about 2.5 GBs.

Step2: Create Bootable Media (Live USB)

Create a bootable USB with the ISO file using various freely available tools e.g., Rufus, Unetbootin, etc. You may visit the below webpage for the step-by-step process to create a live Ubuntu USB media.

TYPE: Use of ICT (A Webpage) **Title:** Preparing Ubuntu bootable usb on windows

Alternatively, we may write the downloaded ISO file on the DVD and make a bootable DVD. We will discuss a step-by-step method for easily available media i.e., USB Flash Drive (pen drives).

Note: You are suggested to take backup of all your data as we will understand how to fresh install Ubuntu from bootable media.

Step 3: Boot from the Bootable Media (Live USB)

1. Plug the prepared live Ubuntu USB disk into our system.
2. Now we need to set the booting sequence to USB disk instead of HDD. This is done by changing boot priority in the BIOS setting (as shown in Fig. 2.4.) at the time of computer start.
3. Restart the computer and access to BIOS setting by pressing function keys F1 or F2 or F10 or F12(or any other) depending on your BIOS and computer manufacturer. It will show your BIOS screen (it may look differ, as per your system). Give a higher priority to your USB drive.

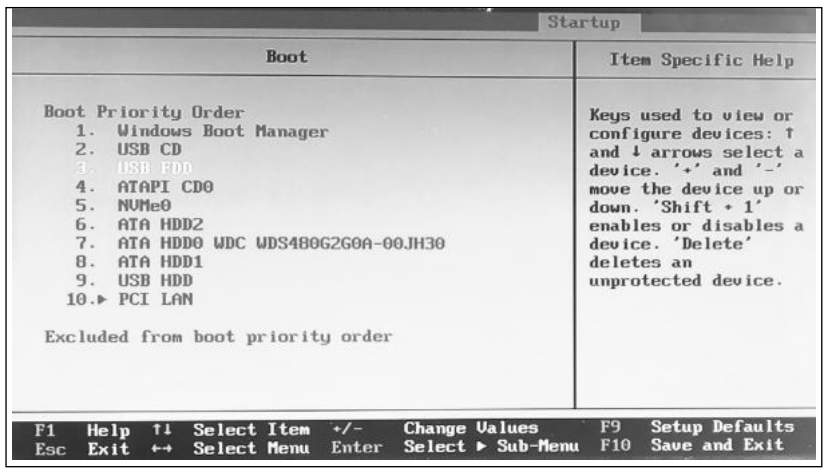


Fig. 2.4: Boot Sequence Options

4. Save and exit BIOS settings.

Step 4: Install Ubuntu

1. The booting process will begin once boot media is detected by the BIOS. The installer will check the disk (file system). The system will prepare to install Ubuntu operating system.
2. After a while, we will see the Ubuntu 20.04 welcome page as shown in Fig. 2.5(a). Here we have to click the Install Ubuntu option.
3. Next, select the language and click continue
4. Thereafter, select the keyboard layout and click the continue as shown in Fig. 2.5(b).

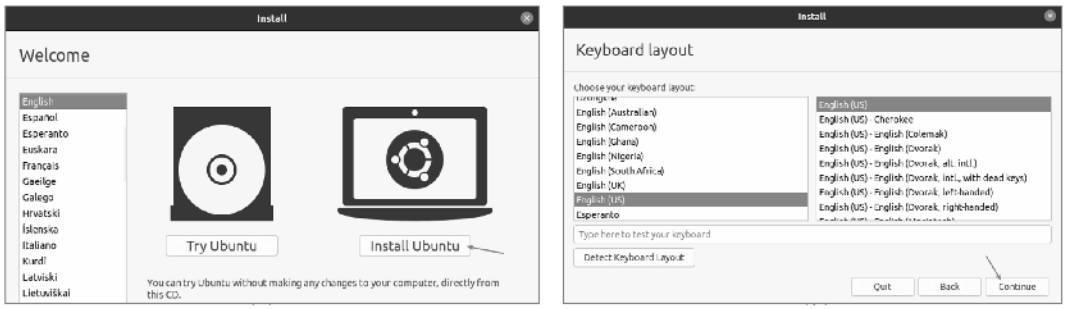


Fig. 2.5: Ubuntu Installation (a) Welcome Screen (b) Keyboard Layout

5. Now, we have to select the types of apps we want to begin with. We may choose any of the available options i.e., Normal or Minimal. We can instruct the installer to update the ubuntu while installing by checking the checkmark option.These options are depicted in Fig. 2.6.

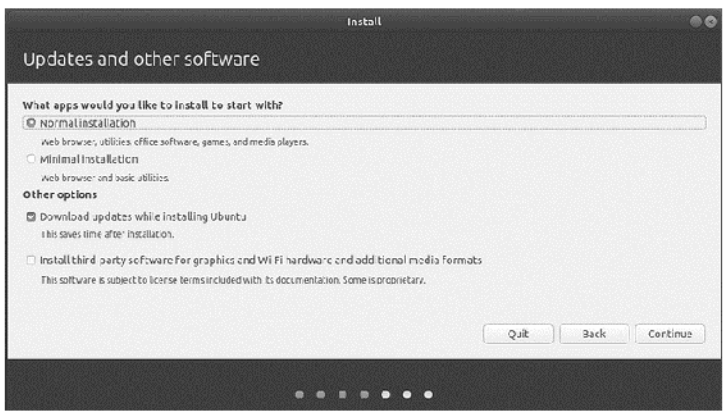


Fig. 2.6: Preparation for Ubuntu Installation

6. In this step, we have to choose the actual installation type. Various options are shown in Fig. 2.7. We choose the option first i.e., "Erase disk and install Ubuntu" for a fresh installation. (**Note:** I hope you have taken the backup of all your data. please do it in advance if proceeding with this way.)

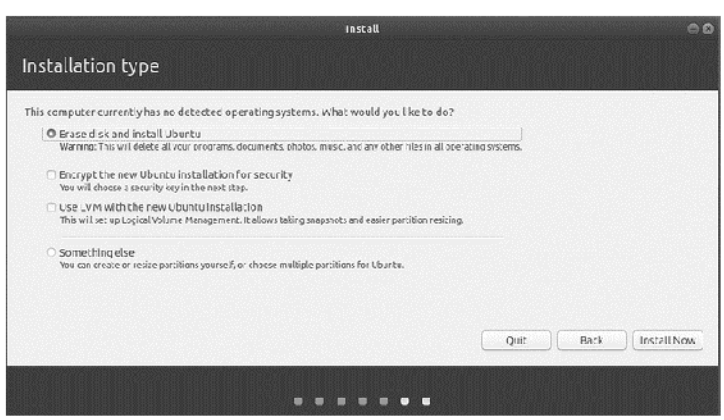


Fig. 2.7: Allocation of Hard Drive Space

7. By clicking on "Install Now" option we will get a warning window as shown in Fig. 2.8. It alerts us about the disk formatting (data deletion). As we took backup so just hit on the continue option.

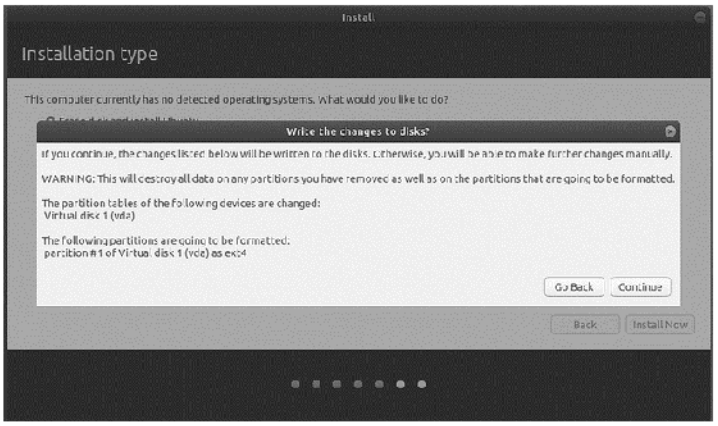


Fig. 2.8: Starting the Installation

8. As shown in Fig. 2.9 we have to select the time zone i.e., "Kolkata" then press continue.

Fig. 2.9: Time Zone

9. Now we will be asked to create login credentials and name of the computer. Click on "Continue" button after telling 'Who are you'. See Fig. 2.10.

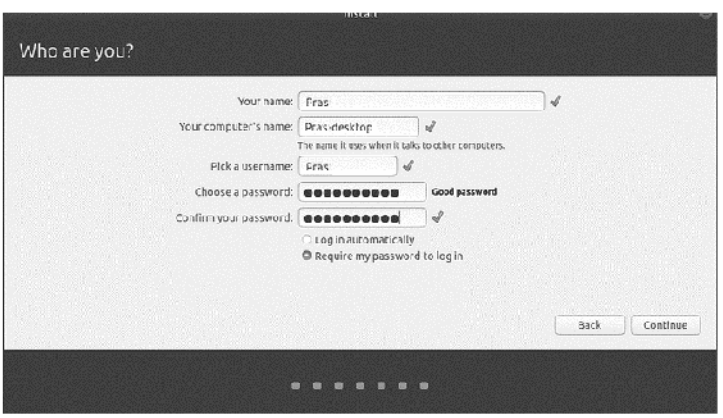


Fig. 2.10: Enter Login Credentials

10. Now we have to wait for 5-10 mins. Meanwhile, we will be presented a slide show about the features of Ubuntu and basic tips for using the OS.

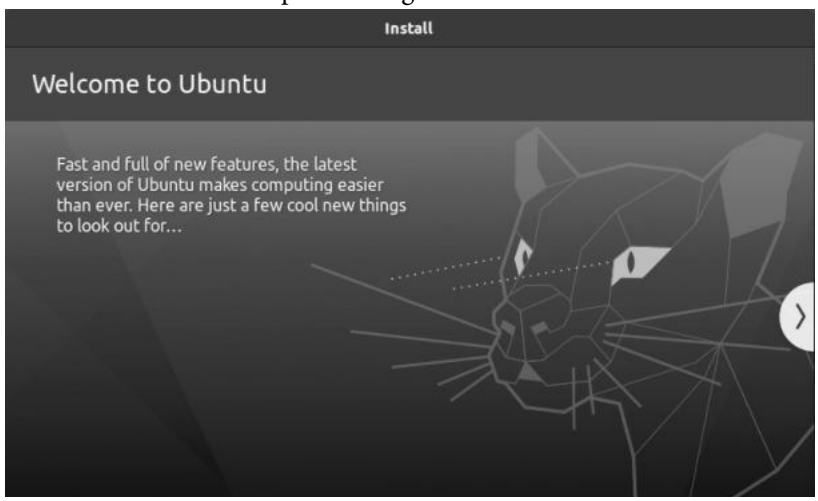


Fig. 2.11: Progress of the Installation

11. After completion of the installation process we will be presented installation complete dialog box as shown in Fig. 2.12, Just hit the 'Restart Now' option to complete the installation process.

Fig. 2.12: Installation Complete Dialog

12. Remove the USB media, Ubuntu will boot from harddisk and we will be shown the Ubuntu home screen as depicted in Fig. 2.13.

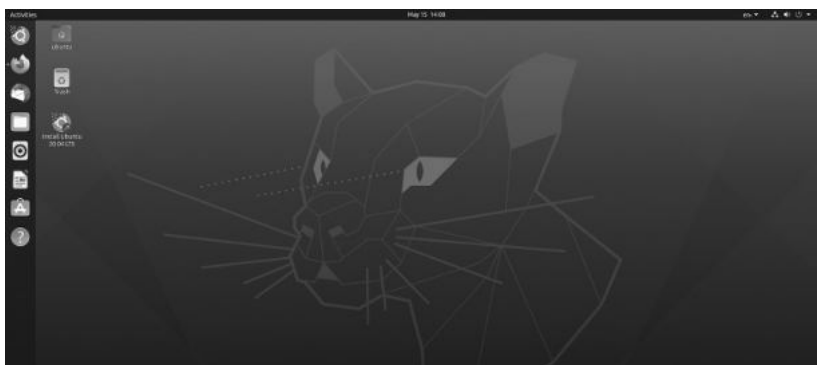


Fig. 2.13: Ubuntu 20.04 Desktop

TYPE: Use of ICT (A Webpage) **Title:** Install Ubuntu

Interesting Facts

- The world's fast supercomputer operating system Tianhe-2 uses Ubuntu OS.
- Ubuntu is most used operating system in web servers.
- Ubuntu's new stable version releases in every six months.
- Google's self-driving cars, Tesla, Netflix, UBER, Dropbox etc. uses the Ubuntu OS.

2.2 WINDOWS OS INSTALLATION

Microsoft's Windows operating systems have a long history of successful operating systems. The Windows OS family has various variants over time. These can be observed easily on our nearby computer systems. Some recent popular members were Windows XP, Windows 7, Windows 8 whereas at the end of 2021 there is news of a new member coming i.e., Windows 11. Here, we learn the basic prerequisites (Table 2.3) and procedures to install Windows 10 that is the latest version of Windows OS.

Table 2.3: Recommended System Requirements for Windows 10

Component	Specification
Processor	1 GHz or faster supported processor
RAM	1 GB for 32-bit or 2GB for 64-bit
Storage	32GB of space or more
Graphics card	Direct X 9 compatible or later with WDDM 1.0 driver
Display	800 x 600 resolution or greater
Internet Access	Some versions of Windows 10 require an internet connection during setup

Installation of Windows 10: A Clean Install

The initial steps for the installation of Windows 10 are similar to the steps we learned in section 2.1.I keep them short here but detailed steps specific for Windows 10 installation are included with screenshots.

Step1: Download Windows 10

First of all, we need a license to install windows 10. We must prepare a bootable DVD or USB flash drive with Windows 10 installer program. You can create Windows 10 installation media with the help of the 'media creation tool' provided by Microsoft. The download link is given below.

https://www.microsoft.com/en-in/software-download/windows10

Step2: Boot from the Bootable Media (DVD/Pen drive)

Now we need to restart the system so that booting the system with help of any boot media. It is necessary to change the boot priority such that the system can boot from the live media. Make necessary boot order as mentioned in section 1.1. Now, when the system starts with bootable media (Live media) it will show a message to 'press any key to boot from CD or DVD'. Just press any key to begin the installation.

Step3: Install Windows 10

1. We will get the first screen (Fig. 2.14). Choose Language, Time and currency format and keyboard or input method from provided drop down boxes. Click "Next".
2. In the next window (Fig. 2.15) click on "Install Now".

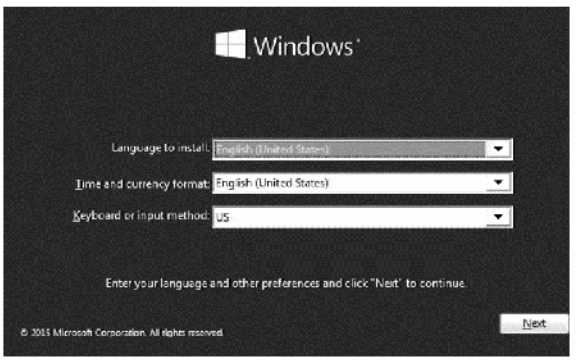


Fig. 2.14: Windows Setup

Fig. 2.15: Install or Repair Screen

3. The next window (Fig. 2.16) will ask us for the licensed product key that came with the purchase of Windows OS. Type the product key in the given box to activate the Windows and click "Next".

Fig. 2.16: Activate Windows

4. The next window (Fig. 2.17) will show the license terms, read and accept terms by marking checkbox checked. Click on "Next".

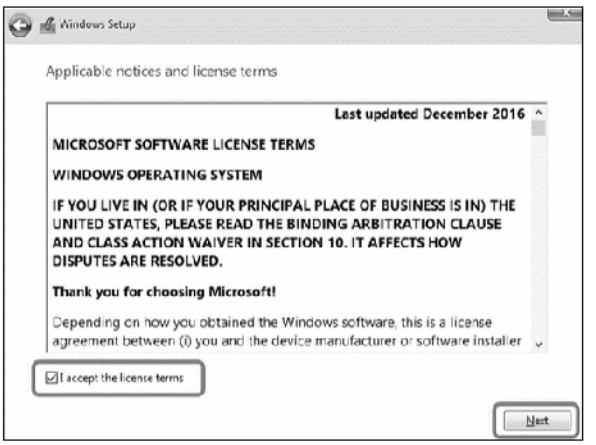


Fig. 2.17: License Terms & Agreement

5. The next screen will ask us to choose the type of installation, select "Custom: Install Windows only (advanced)" by clicking.

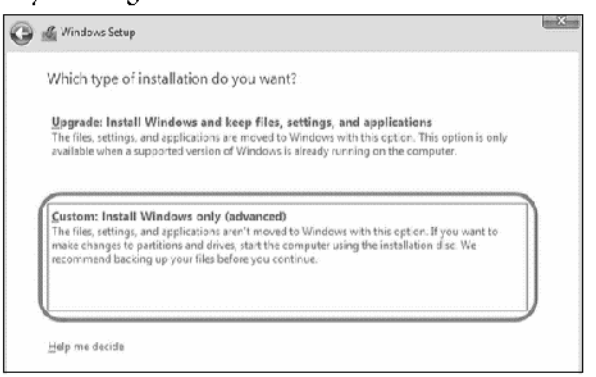


Fig. 2.18: Installation Types

6. Now, select the partition where we want to install the OS. Partitions can be changed with this window. At least 20 GB of free storage is recommended. Here, we can delete, create or format partitions. Data will be kept if we don't format or delete the partition.

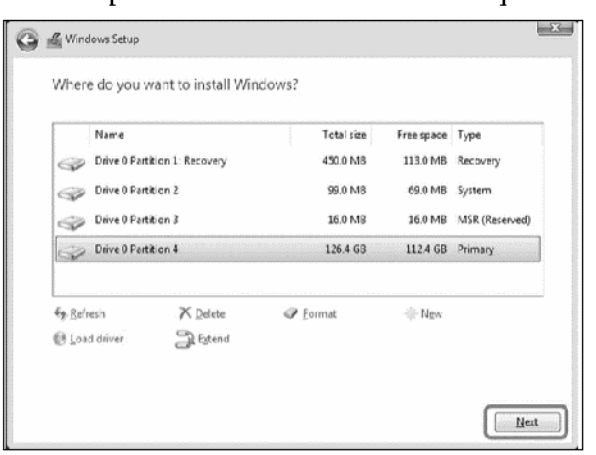


Fig. 2.19: Select Partition to Install Windows

7. Now the installation of Windows proceeds automatically. PC may reboot several times during the process.

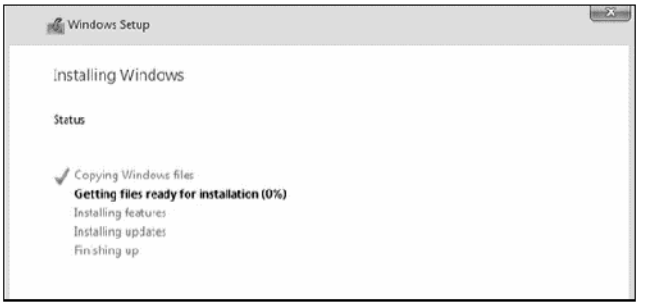


Fig. 2.20: Installation Progress

8. After completing the installation process, we have to select the region and then "Yes".

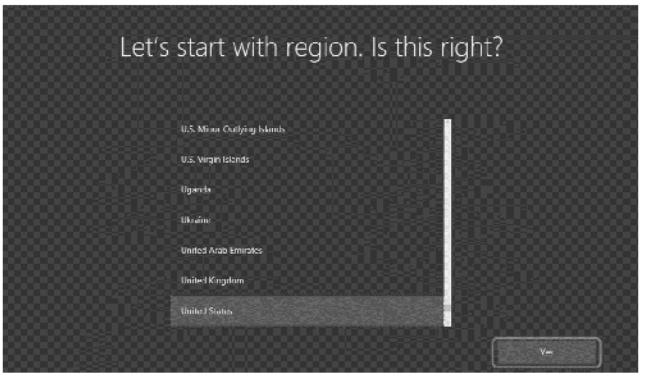


Fig. 2.21: Region Selection

9. Now, we have to select our keyboard layout and then "Yes".

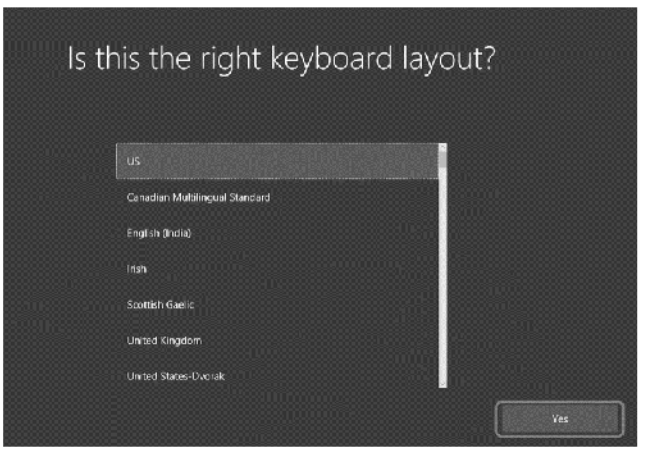


Fig. 2.22: Keyboard Layout Selection

10. Now, select "Set up for personal use" and then "Yes".

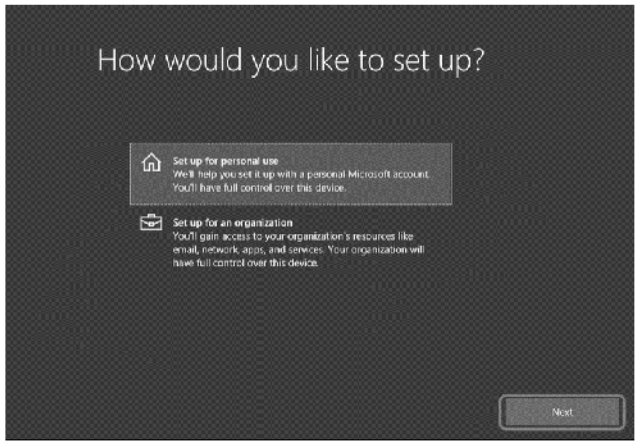


Fig. 2.23: Setup Type Selection

11. Now, sign in with your Microsoft account and click "Next". If don't have an account,here you may create a new one.

Fig. 2.24: Sign In Window

12. Enter your password and click "Next"

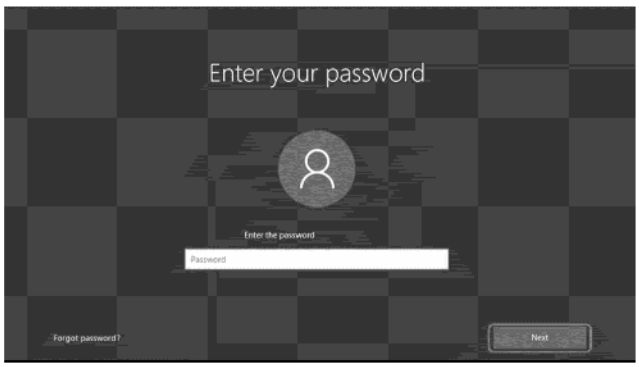


Fig. 2.25: User Authentication

13. Now we have to set up a PIN (Personal Identification Number) that will be useful in logging in to the device, applications and services. Firstly, hit on "Set a PIN" then provide PIN and then "OK".

Fig. 2.26: Set up a PIN

14. If we wish to save our files on OneDrive, we can specify it by clicking "Yes".

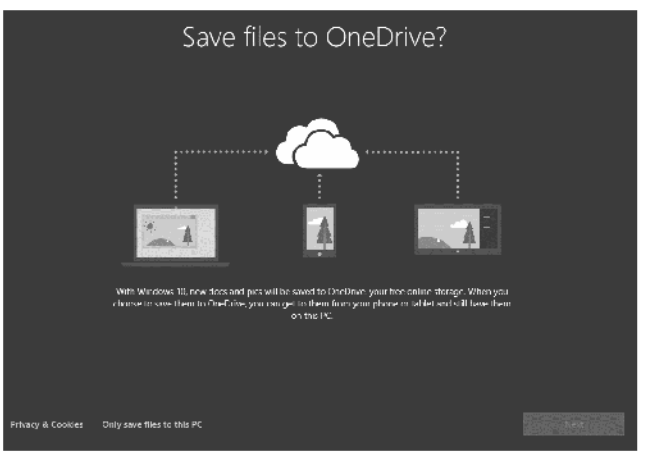


Fig. 2.27: Save Files to OneDrive

15. We can use Microsoft's personal assistant i.e., Cortana by clicking "Yes".

Fig. 2.28: Cortana Configuration

16. Now we have to choose our privacy settings by given toggle buttons. Click "Accept".

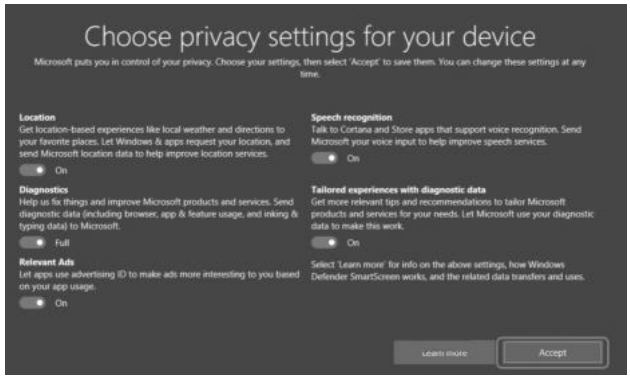


Fig. 2.29: On/Off Privacy Settings

17. Now it may take few minutes to configure and finally, we will get the homescreen or desktop screen of Windows OS as shown in Fig. 2.30.

Fig. 2.30: Windows 10 Desktop Screen

TYPE: Video Resource **Title:** Install Windows 10

Interesting Facts

- Window 1.0 was the first graphical OS of Microsoft that runs on top of the MS-DOS installation (Non graphical, command line OS). It was released on 1985 and requires 192 KB RAM & 256 KB hard disk for installation.
- Window XP was the most successful version among windows operating systems. It was operational for 13 years.

2.3 UNIX SHELL

A shell is a special program that acts as an intermediary between the user and the Kernel of the operating system. A kernel is a backbone of the Unix operating system that is loaded into the memory on system startup (boot-up time) and manages the overall system until shutdown. Shell is a utility program that

starts up when we log on. UNIX shell provides a platform or environment by which any user can interact with the computer system by typing commands.The shell interprets the commands typed by the user in the command line or a script file. A Unix system structure is shown in Fig. 2.31.

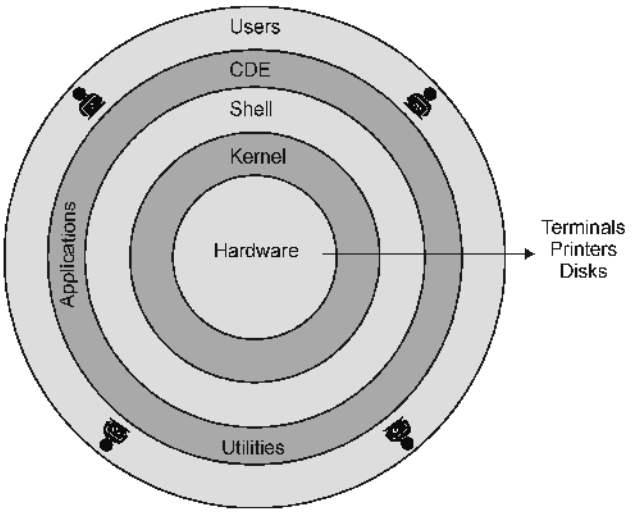


Fig. 2.31: Unix System Structure

In Unix operating systems, there are two types of command inputs. First one is using command line shells like **sh**- the Bourne Shell, **bash**-the Bourne Again Shell and **csh**- the C shell. Second one is using Graphical User Interfaces (GUIs) like KDE and GNOME managers (runs on Linux systems).

2.3.1 Features of Shell

Basic features of all Unix/Linux shells are as below:

1. **Prompt:** Shell displays a character or group of characters (such as $ or #) when it is ready to accept a new command.
2. **Command Interpretation:** When a user enters a command, it is the shell that determines which program to run in order to perform the command.
3. **Multitasking:** Users are provided the facility to run more than one command at a time. It controls the jobs and lets us multitask.
4. **Command History:** Shell keeps track of all the back-to-back supplied commands. It enables the user to repeat the previous commands or similar one.
5. **Wildcards and Aliases:** Shell provides the functionality to use some meta characters (e.g., an asterisk (*), question mark (?), etc.) to abbreviate filenames or pathnames that match a certain set of characters, known as wildcards. In addition, the shell enables a user to avoid typing long commands using aliases.
6. **Piping and I/O Redirection:** Using this functionality, the output of one program can directly be supplied to another program or file.

2.3.2 Shell Types

Some prominent and supported shells on most Unix systems are depicted in Fig. 2.32. Bourne Shell and C Shell are two major types of Shells. By default, the '$' symbol is used as a prompt in Bourne

Shell. In a C-type shell '%' character is the default prompt symbol. The most popular Unix shell is Bash (the Bourne Again Shell). After typing a command, we need to press ENTER key to execute the command.

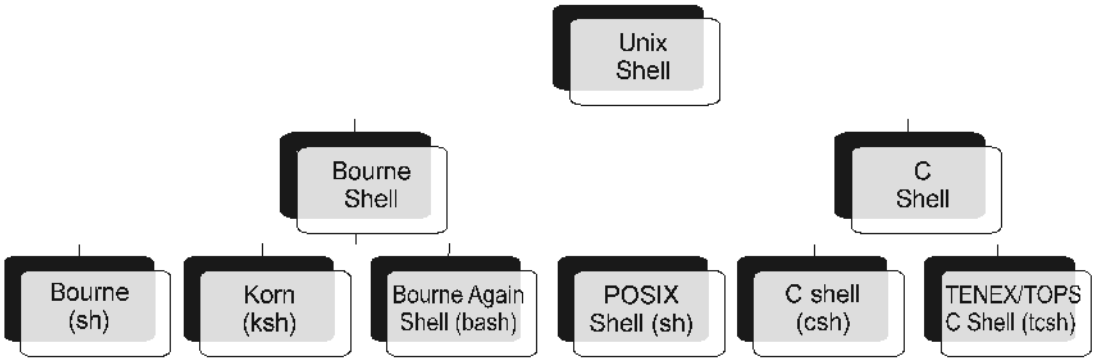


Fig. 2.32: Types of Shells

2.4 SHELL COMMANDS

Shell commands consist of a single or more word separated by white spaces. The first word is the main command to run and subsequent words are options or arguments to the command. A general Unix command structure is:

Command <options><arguments>

Shells also have some commands that are built into the shells, termed as 'built-in' commands. Built-in commands are also known as "internal commands". Some examples of built-in commands are alias, bg, bind, break.

2.4.1 Directory and File Manipulation Commands

pwd: print working directory

The pwd command prints the name of the current or present working directory. It prints the complete path of the current working directory. It is a shell built-in command.

Syntax: $pwd

cd: change directory

The cd command is used to change the current working directory. It is used to move inside a subdirectory.

Syntax: $cd Dir Name

Various symbols can be used with the command. Symbols with their meaning are as under:

single dot (.) : current directory
double dot (..) : upper directory or parent directory
tilde (~) : home directory

ls: lists content of directory

The ls command lists files and subdirectories in a directory. There various important options available with the command.

-l: list all files in long format. (permissions, users, file size, date, and time will be displayed)

-a: list all the hidden files (those beginning with a " . ")

-F: list files distinguishing directories/ executables* symbolic links.

-R: recursively list subdirectories encountered

Syntax: $ls<option> or $ls<option><directory-path>

Fig. 2.33 shows the command line terminal after executing various commands. The figure also indicates that the user's name is **parixit** and host name is **DESKTOP-6U9HK4**, some other illustrations are:

- The ***ls -l*** command shows the long listing of files present in the directory e.g., **/mnt/d/myusers**
- After executing command ***cd 'Nipun audio video'*** $ prompt shifts to right with encapsulating the given directory name. e.g., **/mnt/d/myusers/Nipun/ audio video$**
- The ***pwd*** command shows the present working directory e.g., **/mnt/d/myusers/Nipun/ audio video$**

Fig. 2.33: A Terminal Window Showing 'cd', 'ls' and 'pwd' Commands

mkdir: create a new directory

The ***mkdir*** command is used to create new directory.

Syntax: $ mkdir<name of directory>

rmdir: remove a directory if its empty

The ***rmdir*** command is used to remove directory. To remove directory rmdir command is used.

Syntax: Srmdir<name of directory >

rm: remove files

The rm command use to remove files which is no longer needed.

Syntax: $rm <filename>

mv: move

The mv command used to Move or Rename files or directories.

Syntax: mv [options] <old-filepath><new-filepath>

mv [options] <old-filename><new-filename>

Options: -i query user for confirmation.

Fig.2.34 show the output for sequence of commands. It illustrates:

- First two ***mkdir*** commands create two directories named kapil and Prashant.
- Command ***rmdir kapil*** will remove the kapil directory.
- Execution of command ***rm junagarhfort.txt*** will delete 'junagarh fort.txt' file.
- Execution of ***mv*** command renamed the 'Barmer Blossoms.txt' file to 'Barmer Delight.txt'.
- Finally ***ls-l*** is showing the present status of various directories and files for 'myusers' directory.

```
parixit@DESKTOP-6U9NHK4: /mnt/d/myusers
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$ mkdir kapil
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$ mkdir prashant
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$ rmdir kapil
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$ rm 'junagarh fort.txt'
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$ mv 'Barmer Blossoms.txt' 'Barmer Delight.txt'
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$ ls -l
total 0
-rwxrwxrwx 1 root root   0 Jul 11 11:12 'Barmer Delight.txt'
-rwxrwxrwx 1 root root   7 Jul 11 11:11 'Gods Own Country-Kerala.rtf'
-rwxrwxrwx 1 root root   7 Jul 11 11:11 'Indian culture.rtf'
drwxrwxrwx 1 root root 512 Jul 11 11:17 'Nipun audio video'
drwxrwxrwx 1 root root 512 Jul 11 11:10 'Parixit Documents'
drwxrwxrwx 1 root root 512 Jul 11 11:10  Raghav
drwxrwxrwx 1 root root 512 Jul 11 19:02  prashant
parixit@DESKTOP-6U9NHK4:/mnt/d/myusers$
```

Fig. 2.34: A Terminal Window Showing 'mkdir, 'rmdir','rm' and 'mv' Commands

touch: create file

The touch command creates a new empty file. Multiple files can be created at once using the command. It is also used to change the timestamps of files and directories. The various supported options are:

-a: changes access time of file; -c: checks whether created or not;-m: used to change the modification time. It changes last modification time.

Syntax: $touch <filename>

cat: view complete file content

The cat (concatenate) command is used to create, view and concatenate files. The cat command can be used in the following ways:

Syntax: $ cat <filename> (to **view** a file)

Syntax: S cat <filename1><filename2> (to **view multiple** files)

Syntax: S cat –n filename (to **view** content of file preceding with **line numbers**)

Syntax: $ cat >[new filename] (to **create** a file)

Syntax: $ cat [sourcefilename] > [destination file name] (**Copy** the contents of one file to another file.)

Syntax: $ cat file1 >> file2 (**append** the contents of one file to the end of another file.)

The use of cat and touch command is illustrated in Fig.2.35. Commands were executed onthe terminal in sequence as depicted in Fig. 2.35. We discuss the impact of commands.

- Command in step1 shows content of 'india_olympics.txt' file.

- Step2 and 3 creates files named 'hockey.txt' and 'shooting.txt' with content as shown in Fig. 2.35.
- Command in step 4 is used to append content of 'hockey.txt' with content of 'shooting.txt'. Similarly, step 5 performs the append operation on 'india_olympics.txt' with 'hockey.txt'.
- Command on step 6 shows the result of above operation with updated content of 'india_olympics.txt' file.
- ***touch command*** in step 8 modifies the time stamp of 'shooting.txt' file. As shown in Fig. 2.35 it is changed from 06:45 to 06:49(time when command executed) as depicted in step 7 and step 9.

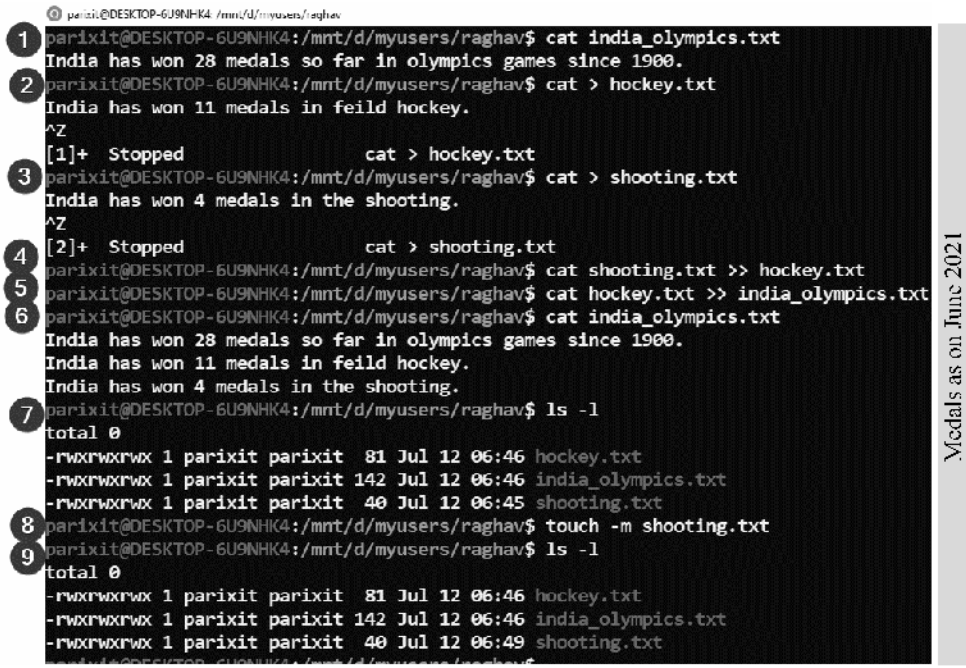


Fig. 2.35: A Terminal Window Showing 'cat' and 'touch' Commands

cp: copy files

The cp command is used to copy files and directories. cp command requires two filenames as arguments.

Syntax: $cp <source_file><destination_file>

2.4.2 Terminal, Information & Utility Commands

clear: clears the terminal

This command clears the terminal.

Syntax: Sclear

echo: write a string to standard output device

Syntax: $echo <string> E.g., Secho I love my India

repeat: repeats commands

Syntax: repeat<number><command>

history: lists the commands typed during the session

Options: -r displays the list in reverse.

help: display information about built-in commands

Displays summaries of built-in commands.

Syntax:help [-dms] [pattern...]

Options: -d: output short description for each topic; -m: display usage in pseudo-manpage format

-s: output only a short usage synopsis for each topic matching

Ex: $rm --help, this command will show us help topics on terminal about rm command.

wc: word count

Counts and displays the number of lines, words and characters of a file.

Syntax: wc [options] <filename>

Options: -c count character only; -l count lines only; -w count words only.

diff: display differences

This command uses to display differences between two files by comparing line by line. It shows differences in form of special symbols a, c, d which stands for add, change and delete. Output of the terminal with these symbols indicates the operations required to make File1 identical to File2.

Syntax: diff [options] <filename1><filename2>

cmp: compare two files

The cmp command compares two files that the two files are identical or not.

syntax: $cmp<filename1><filename2>

grep: globally search for regular expression and print out

This filter is used to search a file for a matching pattern or regular expression.

Syntax: grep [options] <regular-expression><file-name>

Options: -n print lines and line numbers where pattern matches; -v prints all the lines that do not contain the expression; -c This prints only a count of the lines that match a pattern; -h Display the matched lines, but do not display the filenames. Use of grep command is depicted in Fig. 2.36.

Figure 2.36 Illustrates various commands discussed above. Each command is given step number for easy explanation.

- ***Cat*** commands in steps 1 and 2 show the contents of files i.e., 'hockey.txt' and 'shooting.txt'.
- ***diff*** command in step 3 shows the difference between the given file. The output (1d0) refers to a deletion required on line number 1 of 'hockey.txt' file to make it identical with 'shooting.txt'. (Check what differences we get if we give files in reverse order i.e., ***diff shooting.txt hockey.txt***)
- ***cmp*** command in step 4 indicates 15 bytes changed in line number 1.
- Result of executing wccommand is shown in Fig. 2.36 after step5. Here 1 is the number of lines, 8 is the number of words and 40 is the number of characters (bytes) in the 'shooting.txt' file.
- Output of ***history*** command is used to create a file named 'lastcommands.txt'. (Step 6)
- Output of ***grep*** command executed in step 7 shows that search pattern i.e., "medal" found in line number 1 and 2 (occurrence highlighted with a different colour)
- The next result of ***grep*** command shows that two occurrences of pattern found in the given file.

Fig. 2.36: A Terminal Window Showing 'diff','cmp','wc','history' and 'grep' Commands

2.5 VI EDITOR

In Unix, various text editors are provided to edit the files. There are line editors **ed** and **ex** which present a line of the file on the screen; there exist screen editors like **vi** and **Emacs**. **Vi** is a default standard editor that is available in almost all the flavors of Unix operating systems. **Vi** is the short form of Visual editor. It can be used to edit an existing file or create a new file. It can also be used to simply read a text file. There is the latest version of Vi editor which is known as VIM which stands for Vi Improved. 'vi' is a built-in shell command which is used to invoke the vi editor.

Syntax: $ vi <filename>

The above command will open an already existing file, if the file does not exist in the present working directory then a new file will be created and opened in the vi editor.

Vi editor has two modes of operation: command mode and insert mode.

2.5.1 Command mode

The vi editor opens in the command mode. As the name implies it mode is used to perform some commands which in turn causes some actions on the file. In command mode, we can move the cursor and cut, copy, paste the text. Command mode also saves the changes we have made to the file. Hence it performs administrative tasks for file editing. Commands in command mode are case sensitive.

2.5.2 Insert mode

This mode is used for inserting text into the file by vi editor. Whatsoever is typed in this mode is treated as input and placed in temporary memory and after a command from the user it goes to the file. As depicted in Fig. 2.37 by pressing 'i' on the keyboard, we can switch from command mode to the Insert mode. Once we are in Insert mode, any key would be taken as an input for the presently working file. You need to press the 'Esc' key to return to the command mode. Basic commands for Vi editor are listed in Table 2.4 to Table 2.6. To use these commands, you have to be in vi command mode.

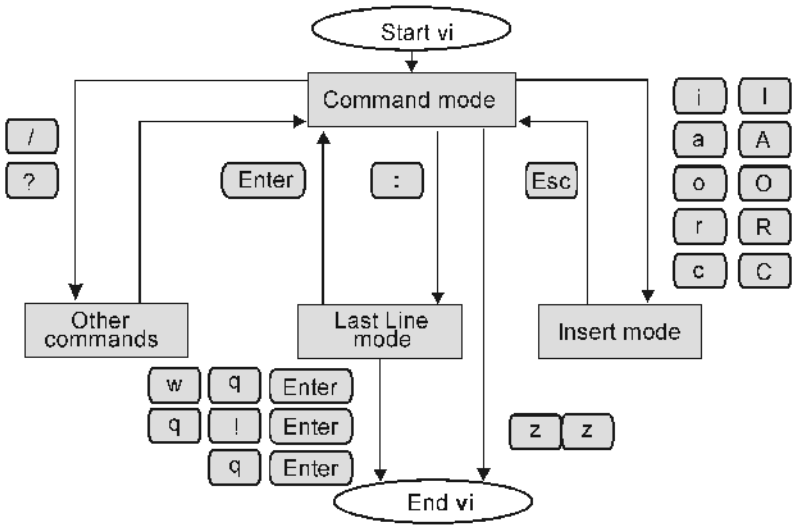


Fig. 2.37: Operating Modes of vi Text Editor

Table 2.4: vi Editor Editing Commands

Key	Function
i	Insert at cursor (goes into insert mode)
a	Write after cursor (goes into insert mode)
A	Write at the end of line (goes into insert mode)
ESC	Terminate insert mode
u	Undo last change
U	Undo all changes to the entire line
o	Open a new line (goes into insert mode)
dd	Delete line
3dd	Delete 3 lines.
D	Delete contents of line after the cursor
C	Delete contents of a line after the cursor and insert new text. Press ESC key to end insertion.
dw	Delete word
4dw	Delete 4 words
cw	Change word
x	Delete character at the cursor
r	Replace character
R	Overwrite characters from cursor onward
s	Substitute one character under cursor continue to insert
S	Substitute entire line and begin to insert at the beginning of the line
~	Change case of individual character

Table 2.5: Moving within a File

Key	Function
k	Move cursor up
j	Move cursor down
h	Move cursor left
l	Move cursor right

Table 2.6: Saving and Closing the File

Key	Function
Shift+zz	Save the file and quit
:w	Save the file but keep it open
:q	Quit without saving
:wq	Save the file and quit

SUMMARY

1. Operating system is a main program of computer system which performs various management tasks.
2. Some popular operating systems are MS Windows, Ubuntu, Mac OS, Fedora, Solaris, Free BSD, Chrome OS, CentOS, Debian, and Android.
3. Ubuntu operating system can be tried without installing it via Live USB/DVD of the operating system.
4. Ubuntu is a FOSS (Free Open-Source Software)
5. Windows operating system is widely used operating system with user friendly GUI.
6. Windows is a proprietary software that requires a legal license to install.
7. Unix shells are utility programs for interaction between users and computer system.
8. In addition to command interpretation shells provide functionality of multi-tasking, command history, wildcards-alias and piping and input output redirection.
9. Shell command consists of a single word or more word separated by white spaces.
10. Vi is a default text editor provided in unix systems to edit or manipulate files.
11. Vi editor has two operational modes command mode and insert mode.

EXERCISES

A. Objective Questions

Q1. Which of the following is not an operating system?
A. SUSE B. Linux C. Oracle D. DOS

Q2. What do you mean by "Booting in" the operating system?
A. To restart the computer B. Install new program
C. To turn off D. None of the above

Q3. Which command is used to find out the current working directory?
A. Wrkdir B. cwd C. pwdir D. pwd

Q4. Which command is used to create a directory?
A. mkdir B. crtdir C. make dir D. crdir

Q5. Which command can be used to delete a file?
A. rm B. remove C. del D. delete

Q6. Which of the following is not a shell?
A. Bourne B. Bash C. Ksh D. Bat

Q7. What is linux?
A. single user, single tasking B. multiuser, multitasking
C. single user, multitasking D. multi user, single tasking

Q8. Which of the following is not a Linux distribution?

A. Debian B. Fedora C. Open SUSE D. Multics

Q9. How many modes in Vi editor?

A. 2 B. 3 C. 4 D. 1

Q10. Shell is ?

A. Interface between user and applications B. Command Interpreter
C. Interface between Kernel and Hardware D. Command Compiler

Q11. BASH shell stands for?

A. Bourne-again Shell B. Basic Access Shell
C. Basic to Advanced Shell D. Big & Advanced Shell

Q12. Which key is used for deleting text in vi editor?

A. d B. y C. k D. f

Q13. Which of the following command is used to delete a single line?

A. d B. x C. X D. dd

Q14. To copy 10 lines from the current cursor location, we can use _____

A. 10y B. yy10 C. 10yy D. 10x

Q15. '10u' command will reverse our 10 last editing actions.

A. True B. False

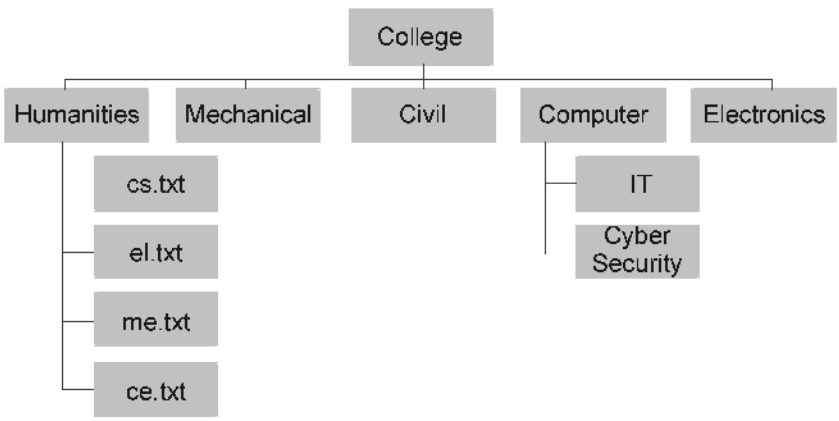
B. Subjective Questions

Q1. Explain the differences between open-source operating systems and closed source operating systems.

Q2. What is Unix shell? Explain its features.

Q3. Run Unix Shell commands to:

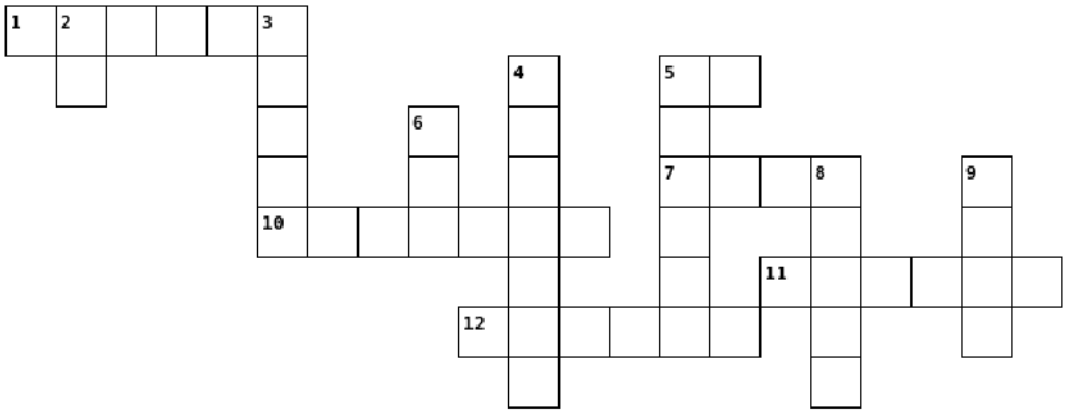
a. Create a directory structure as shown in below figure. A directory named 'College' with five subdirectories Humanities, Mechanical, Civil, Computer & Electronics. Also create four files cs.txt, el.txt, me.txt, ce.txt under Humanities directory and two directories named IT and Cyber security under Computer directory.



b. Copy the cs.txt to Computer directory and el.txt to Electronics directory with cp command
c. Move me.txt to Mechanical directory and ce.txt to Civil directory.
d. Delete Computer directory.

Q4. Create a file named 'purchase.txt' using vi editor and insert text in it. Save and quit the file.

C. Crossword



Across		Down	
1.	a character or group of characters displayed by shell when it is ready to accept a new command	**2.**	a shell command to remove files
5.	a vi editor command to delete a line	**3.**	a shell command to create files
7.	is the firmware used to perform hardware initialization during the booting process	**4.**	a mobile based operating system
10.	a shell command to view the last typed command of the session	**5.**	a Linux based operating system
11.	a backbone of the Unix operating system that is loaded into the memory on system startup.	**6.**	name of pet and a shell command
12.	a functionality that enables the output of one program to be supplied to another program or file	**8.**	a utility program that interprets commands typed by the users
		9.	a filter command for searching a pattern

ANSWERS

A. Objective Questions

Q.N .	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Option	C	A	D	A	A	D	B	D	A	B	A	A	D	C	A

B. Hints for Subjective Questions

A1. Open-source operating system source code is open for all, anyone can modify and update it but closed source operating system source code not available in the public domain. So no one can update or modify the source code.

A2. Shell is a utility program that starts up when we log on. Discuss its various features i.e., prompt, interpretation, multitasking, command history & wildcards and aliases.

A3. The sequence of commands:

a.

i. $ mkdir College

ii. $ cd College
iii. $ mkdir Humanities Computer Electronics Mechanical Civil
iv. $ cd Humanities
v. $ touch cs.txt el.txt me.txt ce.txt
vi. $ cd..
vii. $ cd Computer
viii. $ mkdir IT Cyber Security

b. Use cp command to perform the desired action.
c. Use mv command to perform the desired action.
d. Use rm -r command to recursively delete the directory structure.

C. Crossword

Across: 1-prompt, 5-dd, 7-bios, 10-history, 11-kernel, 12-piping
Down: 2-rm, 3-touch, 4-android, 5-Debian, 6-cat, 8-shell, 9-grep

KNOW MORE

1. Convey the students to install the latest version of the operating system on their personal computer because it will be more secure and featured than older ones.
2. Teachers encourage students not to buy pirated software. Users can be harmed by using security lapses in pirated software.
3. In addition to a clean install of Ubuntu, students can be taught to install Linux Bash shell on Windows OS. See details on the URL: https://itsfoss.com/install-bash-on-windows/or watch mentioned video. **https://www.youtube.com/watch?v=1ap3hL-UR9I**

Applications

Operating systems is necessary for managing and controlling every device. It is available in small wearable device to large and complex control systems. In addition to conventional presence at personal computers and mobile devices OS found its applications in other domains as well, few are listed below:

- Embedded systems used in home appliances.
- Automobile engine controllers
- Industrial robots and Research
- Spacecraft Control System which is used to operate a spacecraft from the ground.
- Large scale computing systems and mobile computing.

PRACTICALS

Experiment 2.1: Operating System Installation

Practical Statement

Install Linux and Windows operating systems on identified lab machines, explore various options, do it multiple times.

Practical Significance

The maintenance of the existing system or upgradation requirements are two key reasons behind the installation of the operating system. An upgraded, updated OS provides robust services to its users. The OS installation skills are necessary for computer users.

Relevant Theory

Installation of Windows and Linux operating systems is elaborated in unit 2, Sections 2.1 and 2.2.

Practical Outcomes (PrO)

The learners will be able to:

PrO1: clean install Ubuntu Linux operating system on an identified lab machine.

PrO2: clean install Windows 10 operating system on an identified lab machine.

Practical Setup (Work Situation)

In this practical, we will clean install Ubuntu and Windows operating system. For the precautionary measure, we must choose a computer machine with no important data.

Resources Required

1. A computer system i.e., PC/Laptop.
2. An internet connection.
3. A bootable media (CD/DVD/USB) having the operating system on it.

Precautions

1. All important data should be backed up before starting the installation process.
2. Recommended system requirements should be checked before the installation process.
3. Besides minimum system requirements, you must also consider the compatibility of the specific components installed in the PC i.e.,, check whether all of your software and hardware will be available in a newer version of OS?
4. If you are installing Windows OS, Keep the serial key handy.

Suggested Procedure

The Step by step detailed process of clean installation for Ubuntu Linux is explained in unit 2, section 2.1. Whereas diagrammatic explanation of Microsoft Windows OS installation is included in the same unit, section 2.2. The procedure includes various steps like download the OS, creation of bootable media, booting from the bootable media, and then actual installation and configuration settings.

Observations

Table 2.7: OS Installation Facts

Sr. No	Your System Configuration (HDD, CPU, RAM, etc.)	OS Version to be Installed	New File System	New Partition Sizes	Time Taken for installation	Key Features of the OS

Practical Related Questions

Note: Below given are few sample questions for reference.

1. What is the preferred file system for Windows?
2. What is the task order when preparing a new hard drive for a new OS installation?
   a. Format, then partition, then install the OS
   b. Partition, then install OS, then format
   c. Format, then install OS, then partition
   d. Partition, then format, then install OS
3. What's the recommended CPU speed and amount of RAM needed to install Windows 10?

Suggested Learning Resources

[1] D. Anfinson and D. Quammen, *IT Essentials PC Hardware and Software Companion Guide.* Madrid: CISC Press.Pearson Education., 2009.

[2] M. Meyers, *Mike Meyers' CompTIA A+ guide : essentials : exam 220-701.* New York: Mcgraw-Hill, 2010.

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment regarding process and product related marks.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Creation of Bootable media	10	
2.	Changing Boot sequence order, defining file system and partition sizes	10	
3.	Explanation of practical components i.e., section 1.2 to 1.7	10	
4.	Procedure adoption and step-by-step explanation	10	
5.	Viva voce	10	
Process Related: ..... Marks* (.....%)			
6.	Preparation of observation tables	25	
7.	Explanation of observation tables & interpretation made	25	
	Total	**100%**	

Name of the Student:..... **Marks Awarded**			**Signature of Teacher with date**
Process Related	Product Related	Total	

REFERENCES AND SUGGESTED READINGS

[1] Sumitabha Das, *UNIX concepts and applications.* New Delhi: Tata McGraw-Hill, 2006.

[2] E. Quigley, *UNIX shells by example*, 3rd ed. Upper Saddle River, Nj: Prentice Hall Professional Technical Reference, 2010.

❑❑❑

3 HTML and CSS

UNIT SPECIFICS

In this unit, learners will know how to build webpages using HTML (Hypertext Markup Language), a useful tool in web development. Learners will also learn to use reinforcement technology to HTML i.e., CSS (Cascaded Style Sheets). CSS is being widely used in web development for attractive display and formatting of information. The unit describes working of different tags of HTML and properties of CSS for creating user friendly web pages. Adequate knowledge of HTML and CSS from this unit will improve student's Efficiency in creating webpage.

RATIONALE

The World Wide Web is an ocean of information, new information is being added every moment and existing information is being discovered anxiously. In section 1.3, we learned how to search for information efficiently through search queries. Have you wondered how this vast majority of information is organized on WWW? How does the display of information differ on different websites? We will learn the answers to all these questions in this unit.

PRE-REQUISITES

- Basic word processing capabilities with any text editor.
- Internet browsing using web browsers e.g., Mozilla Firefox, Google Chrome, etc.

UNIT OUTCOMES

Learners will be able to:

U3-O1: Create webpages on text editors and run them on different web browsers.

U3-O2: Define various HTML tags, format a webpage, and hyperlink webpages.

U3-O3: Define the structure of CSS and apply CSS in different ways on HTML documents.

U3-O4: Apply styles on the webpages with font, text, and background properties.

Table 3.1: Mapping of Unit Outcomes with the Course Outcomes

Unit-3 Outcome	EXPECTED MAPPING WITH COURSE OUTCOMES *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*						
	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
U3-O1	3	1	1	2	3	2	2
U3-O2	2	1	1	1	3	2	1
U3-O3	1	1	1	1	3	2	2
U3-O4	1	1	1	1	3	2	1

3.1 HYPER TEXT MARKUP LANGUAGE 4 (HTML4)

HTML is a useful tool for building webpages and displaying them in web browsers. The existence of the World Wide Web (WWW) consists of innumerable webpages that are interconnected. When these webpages take the form of a group, organized for a specific purpose, they are called websites. The contribution of HTML in the creation of the WWW is incomparable. From time to time, many versions of HTML have become popular in the web programming world. HTML4 is a recent version of HTML. HTML4 is a markup language that is easily understood on almost all web browsers at present.

Although the new version of HTML, HTML5 is also becoming popular with its new tags, there is no doubt about the global spread and acceptance of HTML4. Along with text, multimedia, and hyperlink features available in previous versions of HTML, HTML4 supports scripting languages, style sheets, and other important features. HTML4 supports more multimedia options, it enhances HTML with frames, embedding objects, improved support for the right to left and mixed direction text, richer tables, and enhancements to forms, offering improved accessibility for people with disabilities.

In general HTML document comprises of two functionalities:

1. **Hypertext:** It is a regular text having the capability within the text to connect or reference other documents (Hyperlinking). It can be stored, read, searched, and edited like regular text.
2. **Markup:** It is a system for annotating a document such that it displays intended text in a visually distinguishable manner from other content in the document.

An HTML document is formed with many tags. A tag is a special word enclosed within angular brackets '<' and '>'. This tag is a signal to the web browser about the structuring or formatting of content on a webpage. If a tag conveys structuring information, then it is known as structural tags like <HTML>, <BODY>, <HEAD> etc. If it is informing web browser about the formatting of content then it is known as a formatting tag like <B>, <BR>, <HR>, <IMG>.

In HTML there are two types of tags.

1. **Paired Tags:** Some tags in HTML are used in pairs e.g., <B> tag is used with </B> tag. This tag is used to bold the text in between both of these. Here <B> is called opening tag whereas </B> is termed as companion tag or closing tag. Paired tags are also known as ***container tags.***
2. **Singular Tags:** Such type of tags does not require companion tag or closing tags e.g., <BR>. Singular tags are also known as ***non-container tags.***

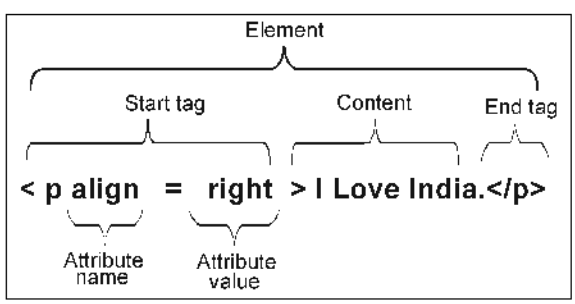


Fig. 3.1: Parts of HTML Container Element

The part of HTML coding from starting tag up to the closing tag is called an ***element.*** In the case of singular tags, the tag itself is an element and known as an empty element. Every tag has its default behaviour if we want to change it, we may use an ***attribute*** of that tag. Attributes are defined in opening tags and they control the behaviour of an element. As shown in Fig. 3.1 the default behaviour of

paragraph tag <p> is left that is changed to right by assigning right value to attribute name align. Fig. 3.1 also depicts the element, start tag, closing tag, attribute name, and its value. Many tags have associated attributes but it is not mandatory for all HTML tags.

3.1.1 Structure of an HTML Document

A general structure of a webpage or HTML document is shown in Fig. 3.2(a). It contains the structural tags and is created in a default text editor of windows i.e., notepad. Any HTML document starts with <HTML> tag and contains two elements i.e., an optional ***Head*** element and mandatory ***Body*** element. The head element contains additional information about the document like the version of HTML, the title of the webpage, metadata, etc. Information contained in this element is not displayed by the browsers but it is to enable the browser about the document. Web browsers display the content written in the Body element. The BODY tag contains all the text and graphics of the document with all the HTML tags that are used for control and formatting of the page. In the coming pages, we will learn in detail various tags that are used inside the body tag.

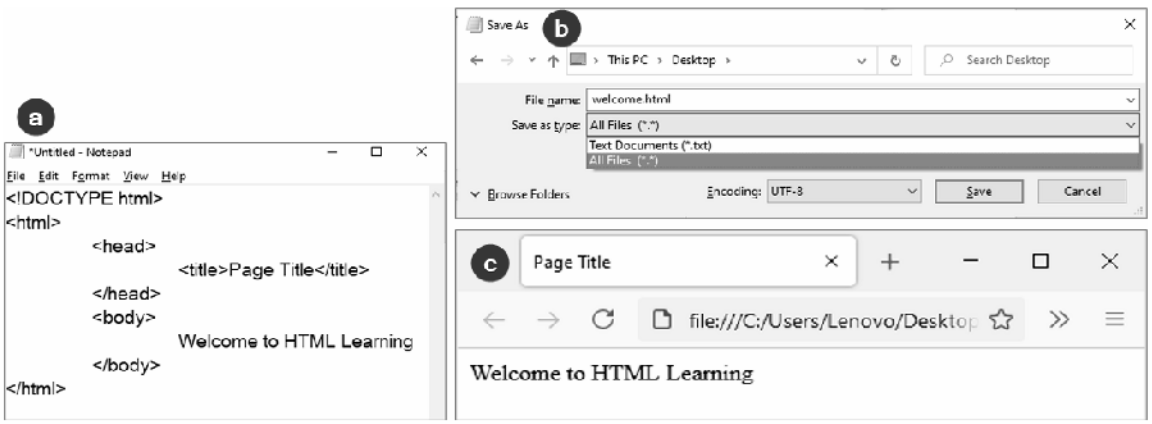


Fig. 3.2: HTML Document (a) General Structure (b) Save as .html (c) Browser Window Output

3.1.2 How to create a Webpage?

An HTML document can be created using any text editor e.g., notepad, notepad++, etc. Along with the normal text editor, WYSIWYG editor (like Dreamweaver) is also popular. In WYSIWYG editors, along with the convenience of writing HTML coding, a preview of how the coding output will look in a web browser is also shown. To learn it practically just follow the below steps.

1. First of all, open any text editor of your choice and type the code shown in Fig. 3.2(a).
2. After creating a text file, we have to save it with .htm or .html extension. To do so, click on the ***File → save as*** option. It will show Save as dialog box as depicted in Fig. 3.2(b). We have to select ***All Files (*)*** list option from ***Save as type.*** Now change the name of our file from 'Untitled.txt' to 'welcome.html' and click on the ***Save*** option.
3. The saved file can be now opened in any web browser using one of the below methods.
   a. Just browse the file and double-click on the file.
   b. Press Ctrl + 'O' keys and select file.
   c. Open your browser and 'Drag & Drop' your html/htm file on the browser window.

Now, the HTML document will be displayed in your default web browser (Mozilla Firefox in our case) like a normal webpage, as depicted in Fig. 3.2(c).

TYPE: Use of ICT (Webpage) **Title:** HTML Basics

3.1.3 Basic HTML Tags

Tags are the main building blocks of HTML. Using predefined tags HTML conveys to the web browser about content display property i.e., how a particular content has to be displayed. Like is used to create a paragraph. is used to bolden a text.

Table 3.2: Formatting Tags

Tag	Description
<CENTER>..</CENTER>	To center align any part of the text.
<P>..</P>	To start a paragraph with new line.
 	Puts a line break in the text. The text appearing after appears in the next line.
<B>..</B>	To **Bold** any part of the text.
<U>..</U>	To Underline any part of the text.
<I>..</I>	To *Italic* any part of the text.
<BLOCKQUOTE>.. </BLOCKQUOTE>	To indent the text from both sides.
<FONT>..</FONT>	To set a specific font for any part of text e.g., face, color, size, etc.
<Hn>..</Hn>	To format headings. Here n is a natural number between 1 to 6.
<HR>	To draw a Horizontal Rule (horizontal line)
^{..}	To superscript any part of the text. E.g., $e=mc^2$ (2 is superscripted)
_{..}	To subscript any part of the text. E.g., H_2O (2 is subscripted)

Table 3.3: Attributes of <P> and <FONT> Tags

Tag	Attribute	Possible Values of the Attribute
<P>	ALIGN	LEFT, RIGHT, CENTER, JUSTIFY
<FONT>	FACE	Any valid font name
	SIZE	Any integer from 1 to 7
	COLOR	Any valid color name or color code e.g., RED or #FF0000

When we design a webpage, tags can be contained in another tag which is known as the nesting of tags. Using nesting we can apply multiple formatting to a given text e.g., we can format text "Fit India" with bold, italic, and underline formatting via nesting of tags i.e., <B><U><I>Fit India</I></U></B>. It will show format text in the browser window as ***Fit India***.

```
<html>
    <head>
        <title>India at the Olympics-Wikipedia</title>
    </head>
    <body>
        <H1>India at Olympics</H1>
        <HR SIZE=5 NOSHADE>
        <P ><B>India</B> first participated at the Olympic Games in <I>1900</I>,with a lone
        athlete (Norman Pritchard) winning two medals- both silver- in athletics and became the
        <U>first Asian nation</U> to win an Olympic medal.
        </P>
        <P align=center>The nation first sent a team to the Summer Olympic Games in 1920, and
        has participated in every Summer Games since then. India has also competed at several
        Winter Olympic Games beginning in 1964.
        </P>
        <FONT FACE="ARIAL" SIZE=3 COLOR="BLUE">Indian athletes have won <B><I><U>35 medals
        </U></I></B>, all at the Summer Games. For a period of time, India national field
        hockey team was dominant in Olympic competition, winning eleven medals in twelve
        Olympics between 1920 and 1980. <BR> The run included 8 gold medals total and six
        successive gold medals from 1928-1956.
        </FONT>
    </body>
</html>
```

Fig. 3.3: HTML Code with Formatting Tags in notepad++ Editor

To learn above discussed tags practically we consider Fig. 3.3. The figure includes the coding part of HTML documents having formatting tags of Table 3.2 and attributes mentioned in Table 3.3. For easier code writing and better representation of HTML code, we have typed the above code in a free text and source code editor software i.e., notepad++. The same code can be typed in any text editor.

Fig. 3.4 : The Webpage on Browser Window

The resulting webpage corresponding to the above HTML code is shown in Fig. 3.4. In Fig. 3.3, the body tag starts at line number 5 and contains all the other tags used to display output on the browser window as shown in Fig. 3.4. Source code line number 6 contains heading formatting tag i.e., <H1>. Next at line number 7 horizontal ruling tag i.e., <HR> tag with its attributes (size and noshade) is used to display horizontal line in the browser window. Line 8 starts with paragraph break <P> tag and then bold tag <B> is used to bold **India**. An Italic tag is used to format the year 1900 in italic form. Further

in line 8 (it's a wrap text) underline tag <U> is used to underline the first Asian nation. All tags discussed above are used with their companion or end tags.

The next paragraph starts at line number 10 with paragraph tag in association with its attribute align and value equals to center. The next we encounter tag <Font> at line number 12 with its attributes. i.e., Face= "ARIAL" size=3 COLOR='BLUE'. Further in this line text "35 medals" is formatted as bold plus italic plus underline, hence we get ***35 Medals*** formatted text in the browser window as depicted in Fig. 3.4. The line break tag <BR> is used at the end of line number 12.

3.1.4 Page Setting Tags

These tags are used to set the title of the webpage, its background color, and color of text, etc. A page title is a text which is shown on the title bar of the web browser window. In case of a missing title tag in HTML coding, by default, it will show the name of the document. As shown in Fig. 3.4 page title of the webpage is "India at the Olympics-Wikipedia". The Title tag is used inside the Head tag, it is depicted in Fig. 3.3, line number 3. Color of page background and text can be set using various attributes of <BODY> tag. These attributes are shown in Table 3.4.

Table 3.4: Attributes of <BODY> Tag

Attribute	Possible Values of the Attribute
BACKGROUND	Used to display an image in background of webpage
BGCOLOR	Used to specify background color of webpage. Color name can be given in name or RGB Values
TEXT	Used to set the color of the normal text in the document. Color name can be given in name or RGB Values

3.1.5 Listing Tags

HTML provides three ways to specify a list of information. All types of lists must contain one or more list elements. Various listing tags are presented in Table 3.5. The list types are:

1. **Unordered list:** This list starts with <UL> and ends with </UL>. Each list item starts with <LI> and </LI> is optional to use. It supports to TYPE attribute which can be assigned value FILLROUND (for a solid round black bullet) or SQUARE (for a solid square black bullet) or DISC (a hollow round black bullet).
2. **Ordered list:** This list is contained within <OL> ..</OL> tags. Each list item starts with <LI> tag and </LI> tag is optional to use. Attributes of ordered list items are presented in Table 3.6.
3. **Definition lists:** HTML definition lists are used when we require to describe the listed items. The <DL> tag defines the description list, the <DT> tag defines the term (name), and the <DD> tag describes each term:

Table 3.5: Listing Tags

Tag	Description
<UL>	Used to Define an unordered list
<OL>	Used to Define an ordered list
<LI>	Used to Define a list item
<DL>	Used to Define a description list
<DT>	Used to Define a term in a description list
<DD>	Used to Describe each term

To learn HTML lists an example with all listing tags is demonstrated in Fig. 3.5. The coding window depicted in Fig. 3.5(a) shows the HTML code to be written to get output as depicted in Fig. 3.5(b).

We discuss the source code depicted in Fig. 3.5(a). The <ol> tag in Line number 7 is used to define an ordered list. Items (Hockey, Basketball, and Archery) of this list are given by <li> tags as shown in lines number 8 to 10. This list is depicted as a numbered list at beginning of Fig. 3.5(b). Further, line no 13 defines an unordered list with <ul> tag, and its list items are defined at line numbers 14 to 16. This list is shown as a bulleted list in Fig. 3.5(b). Lastly, a definition list is formed with the <dl>, <dt> and <dd> tags. At the last of the browser window, the definition list is depicted. It defines the terms Hockey and Baseball. (See Fig. 3.5(a), line number 19 to 24)

```
6   <h4>Sports: Ordered list</h4>
7   <ol>
8       <li> Hockey</li>
9       <li> Baseball</li>
10      <li> Archery</li>
11  </ol>
12  <h4>Sports: Unordered list</h4>
13      <ul>
14          <li> Hockey</li>
15          <li> Baseball</li>
16          <li> Archery</li>
17      </ul>
18  <h4> Sports : Definitions Lists  </h4>
19      <dl>
20          <dt>Hockey:</dt>
21          <dd>- is a sport in which two teams
            play against each other by trying to
            manoeuvre a ball or a puck into the
            opponent's goal using a hockey stick.
            </dd>
22          <dt>Baseball:</dt>
23          <dd>- is a bat-and-ball game played
            between two opposing teams who take
            turns batting and fielding.  </dd>
24      </dl>
```

Fig. 3.5: HTML List an Example (a) Coding Window (b) Browser Window

Table 3.6: Attributes of Ordered List Item

Attribute	Possible Values of the Attribute
TYPE	This attribute controls the numbering scheme. 1: will give counting numbers (1, 2.....) A: will give uppercase letters (A, B,....) a: will give lowercase letters (a,b,....) I: will give uppercase roman numerals (I, II,....) i: will give lowercase roman numerals (i, ii,....)
START	Used to change the numbering sequence.
VALUE	Used to change the numbering sequence in the middle of ordered list.

3.1.6 Adding Graphics to HTML

In addition to text formatting and listing, HTML also provides the facility to add graphics and images to a document. Graphic images are added in HTML using <img> tag. The <img> tag is an empty (singular) tag that contains attributes only, it does not require a closing tag.

Table 3.7: Attributes of <IMG> Tag

Attribute	Possible Values of the Attribute
ALIGN	This attribute controls the alignment of text following the image. Values: TOP, MIDDLE, BOTTOM, LEFT, CENTER & RIGHT
BORDER	Used to specify the size of border, around the image.
WIDTH	Used to specify width of the image in pixels or %
HEIGHT	Used to specify height of the image in pixels or %
HSPACE	Indicates horizontal space between the table and surrounding text
VSPACE	Indicates vertical space between the table and surrounding text
ALT	It is alternative text to be displayed when image not found or loaded
SRC	Location and name of source image file is given by this attribute

To practice, the <IMG> tag, type the source code shown in Fig. 3.6 in any text editor and save it with .htm or .html extension. You should use any available image of your choice for your hands-on purpose. Ensure that the image which you are going to include must be present in the same folder, where you saving the HTML code. Now open the webpage in any web browser to see the difference between using <IMG> tag with no attributes and with given attributes, as shown in Fig. 3.6. The source code is having two <IMG> tags.

```
<body>
    <img src="swami vivekanand.png" > Swami Vivekananda (January 1863 – 4 July 1902), was
    an Indian Hindu monk. He was a chief disciple of the 19th-century Indian mystic
    Ramakrishna.He was a key figure in the introduction of the Indian philosophies of
    Vedanta and Yoga to the Western world
    <HR>

    <img src="swami vivekanand.png" width=300 height=150 align=right alt="swami vivekanand"
     vspace=20 hspace=20 border=2> Swami Vivekananda (January 1863 – 4 July 1902), was an
    Indian Hindu monk. He was a chief disciple of the 19th-century Indian mystic
    Ramakrishna.He was a key figure in the introduction of the Indian philosophies of
    Vedanta and Yoga to the Western world
</body>
```

Fig. 3.6: Adding Graphics in HTML (Source Code)

The first <IMG> tag is used to display "swami vivekanand.png" file to our browser followed by given text content. We only supplied the name of the image file with the src attribute. It means the image file is in the same directory where the source code resides. The second <IMG> tag encounters just after horizontal line i.e., <HR> tag. In addition to the src attribute, the second <IMG> tag also defined other attributes and assigned value to them. The later <IMG> tag has customized the image size by assigning width and height values to 300 and 150 pixels respectively. Default alignment type of image is also changed to right and alternate text "swami vivekanand" is defined for the situation that the file is not found or any loading issue. The browser window in Fig. 3.7 shows space between the horizontal line and the second image, it is given by VSPACE=20. Similarly, space between the second image and right border is provided by HSPACE=20. The second image also shows a border around the image which is due to the value 2, assigned to the attribute border.

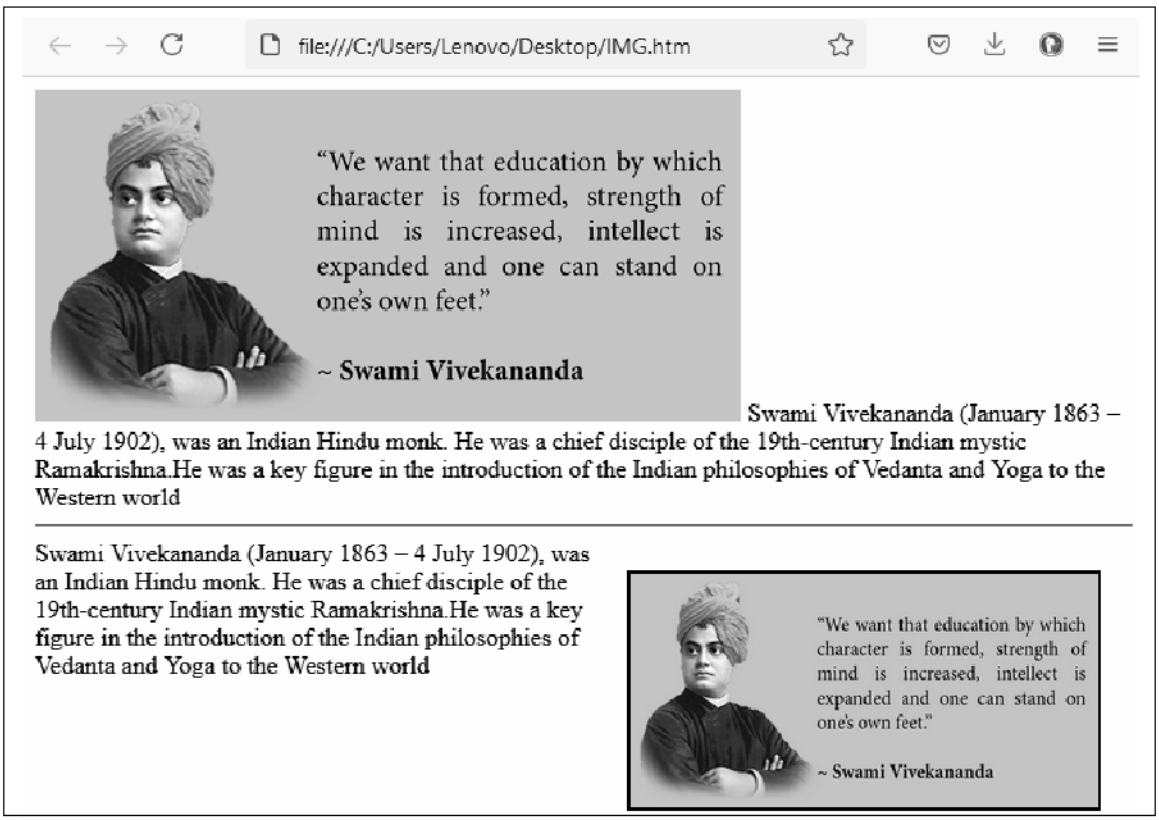


Fig. 3.7: Adding Graphics in HTML (Browser Window)

3.1.7 Working with HTML Tables

To display data in form of a two-dimensional matrix or more precisely, in form of rows and columns, <Table> tag is used. It is a paired tag and ends with </TABLE> Rows of table are defined between <TR>..</TR> tags whereas columns are defined between <TD>..</TD> tags. HTML tables are strengthened by Header Row. It is a special row that spreads across columns of a table. Header row is defined between <TH>..</TH> tags.

Table 3.8: Attributes of <TABLE> Tags

Attribute	Possible Values of the Attribute
ALIGN	This attribute controls the horizontal alignment. Values: LEFT, CENTER, or RIGHT
VALIGN	Controls the vertical alignment of cell contents. Values: TOP, MIDDLE, or BOTTOM
WIDTH	Used to specify the width in form of pixel values or % of available screen
BORDER	Used to specify the border around the table, table width is given in pixels
CELLPADDING	Used to specify the distance between data and boundaries of the cell.

CELLSPACING	Used to specify the distance between nearby cells.
COLSPAN	Indicates the browser to take up space more than one column. This attribute is used inside <TH> or <TD> tags.
ROWSPAN	Indicates the browser to take up space more than one row. This attribute is used inside <TH> or <TD> tags.

HTML tables have one more important table related tag i.e., <CAPTION>..</ CAPTION >. It is used to provide metadata about the table content. The caption for the table can be placed above or below the table structure with the ALIGN attribute set to TOP or BOTTOM.

To practice tables in HTML, an example of a table is demonstrated in Fig. 3.8 to Fig 3.10. Source code for depicted a default table and corresponding browser output is shown in Fig. 3.8(a) and Fig.3.9(a) respectively. Source code illustrates the use of <CAPTION> tag and sets its position to the bottom of the table structure. Use of <TH> tag for a table header, <TR> for table row definition, and <TD> for table data is also presented. Fig 3.8(a) shows the use of basic table tags without specifying attributes (except Align=bottom). The HTML source code in Fig 3.8(b) shows the use of various supported attributes (e.g., BORDER=5 WIDTH=50% align=center cellpadding=5 and cellspacing=2).

```
<body>
Default Table
<HR>
<table >
<CAPTION ALIGN=BOTTOM>
Table 1: Medals in Field Hockey
& Shooting</CAPTION>
    <tr>
        <th>Sport</th>
        <th>Gold</th>
        <th>Silver</th>
        <th>Bronze</th>
        <th>Total</th>
    </tr>
    <tr>
        <td>Field hockey</td>
        <td>8</td>
        <td>1</td>
        <td>3</td>
        <td>12</td></tr>
    <tr>
        <td>Shooting</td>
        <td>1</td>
        <td>2</td>
        <td>1</td>
        <td>4</td>
    </tr>
</table>
```

```
<body>
Table with cellpadding=5 and
cellspacing=2
<HR>
<table BORDER=5 WIDTH=50% align=
center cellpadding=5 cellspacing=2>
<CAPTION ALIGN=BOTTOM>Table 1:
Medals in Field Hockey & Shooting
</CAPTION>
    <tr>
        <th bgcolor=gray>Sport</th>
        <th>Gold</th>
        <th>Silver</th>
        <th>Bronze</th>
        <th>Total</th>
    </tr>
    <tr>
        <td>Field hockey</td>
        <td>8</td>
        <td>1</td>
        <td>3</td>
        <td>12</td></tr>
    <tr>
        <td>Shooting</td>
        <td>1</td>
        <td>2</td>
        <td>1</td>
        <td>4</td>
    </tr>
</table>
```

Fig. 3.8: HTML Table (Source Code) (a) Table with Align Attribute (b) Various Table Tag Attributes

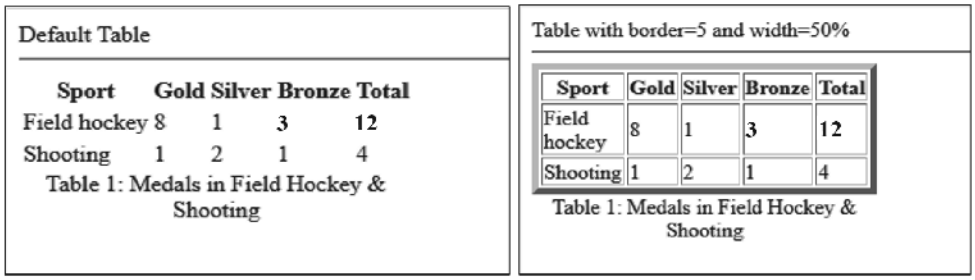


Fig. 3.9: Browser Output (a) A Default HTML Table (b) Table with Border and Width Attribute

The output of the source code in Fig. 3.8(b) is presented in Fig. 3.10(b). Browser window output in Fig. 3.9(b) and Fig. 3.10(a) is due to the use of different sets of attributes. Fig. 3.10 shows table is presented at the center of the screen due to attribute align=center. Cell number one is having a dark background color, as it is assigned by attribute bgcolor=gray in first <TH> tag of first <TR> tag (see Fig. 3.8(b)).

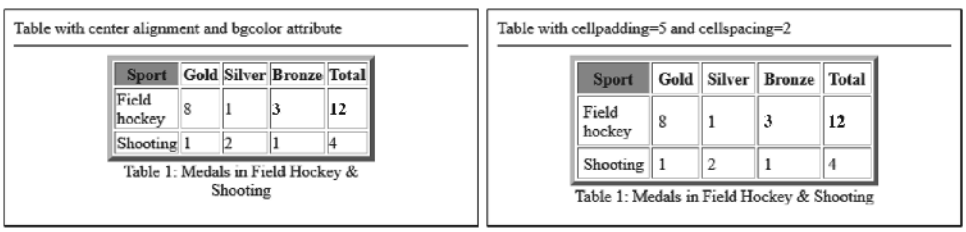


Fig. 3.10: Browser Output for Table with (a) Align and BGCOLOR Attribute (b) CELLPADDING and CELLSPACING attribute

3.1.8 Linking Webpages

Connecting one HTML document to others is the key reason for the development of the world wide web. This capability of linking several web resources (HTML documents, images, or other multimedia content) is known as hyperlinking. The hyperlinks can be created on a webpage with text or images. The text or image having linking functionality is known as hypertext or hyperlink. The browser displays hyperlinks in a distinguishable manner than normal content as listed below:

- Normally appears in blue color. (We can customize if we require)
- The hypertext/image is underlined.
- On moving the arrow cursor upon a hyperlink, our default arrow mouse cursor will turn into the shape of a little hand.

The HTML anchor tags i.e., <A>..</A> are used to create hyperlinks. Anything between <A>..</A> becomes a hyperlink. <A> tag requires to specify the destination URL where we want to navigate on the click at the link. This is done by supplying URL value to the mandatory HREF attribute. Below is the syntax for creating a hyperlink:

<A Href="URL">link text</A>

Fig. 3.11: An Anchor Tag Syntax

An example of the anchor tag is depicted in Fig. 3.11 which illustrates that the website *www.aicte-india.org* will be navigated by clicking on the text *Link to website of AICTE*.

Internal Document Reference

In addition to external web resource linking, HTML provides a mechanism to reference information on the same webpage. It is done by naming the locations of a webpage such that these named locations can be referenced when required.

Syntax: <A Name = "LocationName" >
<A HREF=LocationName>..</A>

Images as Hyperlinks

Images can also be used for hyperlinks. We need to use <IMG> tag between the <A>..</A>.

Syntax: <A HREF=LocationName><IMG source= "image_name.jpg" ></A>

```
<html>
    <head>
        <title>Education-India</title>
    </head>
    <body>
        <A HREF="#about_aicte"> About AICTE</A>   <A
        HREF="#about_ugc"> About UGC</A><br><HR>
        <A HREF=https://www.aicte-india.org/><img src=
        "AICTE_LOGO.jpg" width=90 height=90 align=right alt=
        "Logo AICTE"  ></A>
        <A HREF=https://www.aicte-india.org/> Link to website
        of AICTE</A><br><br>
        <A NAME="about_aicte">All India Council for Technical
        Education (AICTE) was set up in November 1945 as a
        national-level Apex Advisory Body to conduct a survey
        on the facilities available for technical education
        and to promote development in the country in a
        coordinated and integrated manner.</A><br>
        <HR>
        <A HREF=https://www.ugc.ac.in/><img src="ugc_logo.png"
        alt="Logo UGC"  ></A>
        <A HREF=https://www.ugc.ac.in/> Link to website of UGC
        </A><br><br>
        <A NAME="about_ugc">
The University Grants Commission (UGC) came into existence on
28th December, 1953 and became a statutory Organization of the
Government of India by an Act of Parliament in 1956, for the
coordination,determination and maintenance of standards of
teaching, examination and research in university education.</A>
    </body>
</html>
```

Fig. 3.12: Linking Webpages (Source Code: Anchor.htm)

Hyperlinking with anchor tag <A> is demonstrated in Fig. 3.12 (source code) and Fig. 3.13 (browser window output). The webpage is designed with the intention to clarify different attributes and ways to

use anchor tags. The document is logically divided into three parts each separated by a <HR> tag. The first part shows two hyperlinks that reference a named location on the same webpage. The second part incorporates information pertaining to AICTE, a text hyperlink (About AICTE), and an image hyperlink (Logo Image of AICTE). This can be observed between both horizontal lines in Fig. 3.13(a). Similarly, the third part contains the same tags for information related to UGC.

Line number 6 of source code (see Fig. 3.12) has defined two anchor tags that reference to named location on the same file i.e., Anchor.htm. This fact can be verified by line number 9 and 13 which includes the declaration of named location i.e., "about_aicte" and "about_ugc". Line number 7 shows the image hyperlink for AICTE's website whereas line number 8 is a simple text hyperlink for the same. Fig. 3.13 also illustrates that the mouse cursor is turned in little hand which indicates a hyperlink. In Fig 3.13(a) it is referencing to "about_ugc" named location on the same file (as shown in the bottom status bar). Similarly, in Fig 3.13(b) an image hyperlink is referencing the website of UGC.

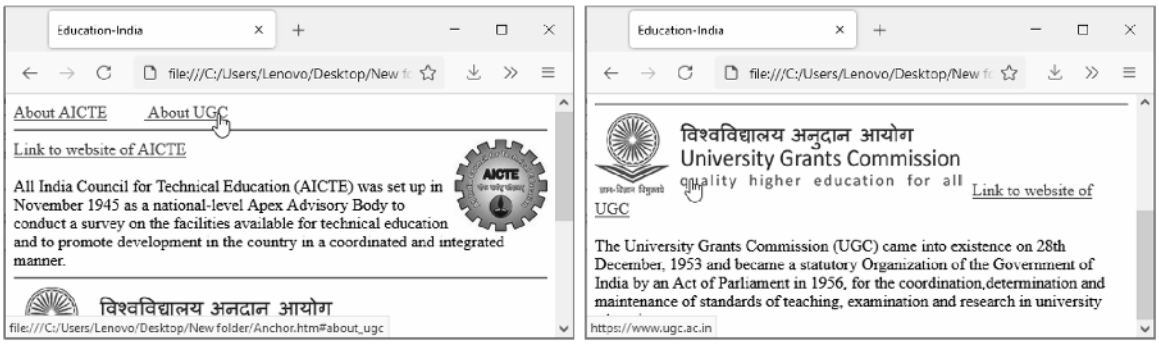


Fig. 3.13: Anchor Tag (a) Internal Document Reference (b) Image as Hyperlink

3.1.9 HTML Forms

HTML Form is a method to interact with the users. Such interaction can be to take information from the users e.g., registration form, feedback form, etc. HTML forms are composed of various components like text boxes, radio buttons, list boxes, command buttons, and so on. A webpage equipped with form components, takes user choices and submits them to the server for processing via 'POST' or 'GET' method. The syntax is as under:

<FORM METHOD = "GET | POST" ACTION = URL>
<INPUT>
<INPUT>
</FORM>

Here, Action specifies the URL to which content of the form is submitted whereas Method specifies how to send form data. The form data can be sent as URL variables (with method= "get") or as HTTP post transaction (with method= "post"). Now, will discuss various form components.

Input Tag

Input tag is used to collect information from the users. The various attributes of the input tag are depicted in Table 3.9. Various input types supported by <INPUT> tags are as under:

Textbox Field: It is used to accept single line input from the user. It is defined as <input type= "Text">. Along with this the TextBox field accepts value, size, name, maxlength, align and tabindex within the <input> tag.

Table 3.9: Attributes of <INPUT> Tag

Attribute	Possible Values of the Attribute
NAME	Assigns internal name for the field, as a group of characters
SIZE	Define width of the field, value in integer
MAXLENGTH	Define maximum number of characters accepted by the field, value in number
TYPE	takes the value of the field. It can take the value as "text" or "radio" or "checkbox" or "submit".

Radio Buttons: It is used to accept one option out of various provided options. It is defined as <input type= "Radio">.

Checkboxes: It is used in web forms to select multiple options out of various provided options. It is defined as <*input type*= "checkbox">.

Command Button: If the value of the type attribute is "Submit" i.e. <input type= "submit | reset">, the form will show a command button. A *submit* button submits a form. A form may contain more than one submit button. A *reset* button resets all controls to their initial values.

Text Area

This form component is used to take multiline input from the user. It is defined between <TEXTAREA>..</TEXTAREA> tags. Various attributes are presented in Table 3.10. Use of Text Area is shown in Fig. 3.14 for taking Address input from the user.

Table 3.10: Attributes of Text Area Component

Attribute	Possible Values of the Attribute
COLS and ROWS	Defines length of text area (COLS) and number of rows to be visible with text at a time (ROWS), Numbered input allowed
NAME	Internal name of field for programming purpose
TABINDEX	Used to assign order number of activation for control
WRAP	Defines Wrap Text functionality for control. Three possible values: wrap off, virtual and physical.

Drop Down Box

This webform component contains a list of items. Users have to select one out of them. This component is formed in webpage within <SELECT> and <OPTION> tags. Attributes of this field are presented in Table 3.11. Use of this component is shown in Fig. 3.14 for taking Branch and Year input from user.

Table 3.11: Attributes of Drop Down Box Component

Attribute	Possible Values of the Attribute
NAME	Internal name of the field for programming purpose
SIZE	Defines number of items visible when user opens the drop down list
MULTIPLE	When configured allows user to select multiple items
VALUE	Defines the actual value to be transferred when an item is selected

Table 3.12 contains the HTML source code to design a simple web form for taking student's choices to participate in annual day functions. Textboxes are used to take input of the student's name, mobile number, and email id. Corresponding HTML code is presented in line number 9, 24, and 25. The radio button is included to choose the gender of the student, see HTML source code at lines 10 and 11. Branch and year pertaining to the student will be chosen from drop down lists. HTML code to create such lists is at line number 12 to 22. The text area component is used to take address input and HTML code with attributes of text area component is at 23. Use of check box component is presented at line number 27 to 30. The reset command button is included to clear the content of the web form whereas submit button POST the data to local_server. The code corresponding to submit button is at line 7, 31 and 32.

Fig. 3.14 depicts the output in a browser window.

Table 3.12: Web Form (HTML Code) for Annual Day Participation

```
1  <html>
2          <head>
3                  <title> Web Form and its components</title>
4          </head>
5  <body>
6  <table border=3 width=50% align=left cellpadding=5><tr><td>
7  <form action="local_server" method="post" name="form1">
8  <h3>Participation form for annual day function.</h3>
9  Your Name: <input type="text" name="text1"><br><br>
10 I am a<input name="radio1" type="radio" value="radio1"> Girl
11           <input name="radio1" type="radio" value="radio2">Boy <br><br>
12 Branch:<select name="select">
13         <option selected>Computer Science</option>
14         <option>Civil</option>
14         <option>Mechanical</option>
16         <option>Electrical</option>
17         </select>   
18 Year:<select name="select">
19         <option>First</option>
20         <option>Second</option>
21         <option>Third</option>
22         </select><br><br>
23 Address:<textarea name="textarea" cols=20 rows=3></textarea> <br><br>
24 Mail ID:<input type="text" name="text2">
25 Mobile No.:<input type="text" name="text3"><br><br>
26 Choose your participation<br>
27         <input type="checkbox" name="cb" value="song"> Song
28         <input type="checkbox" name="cb" value="instrument">Instrument Play
29         <input type="checkbox" name="cb" value="poem">Poem
30         <input type="checkbox" name="cb" value="deb">Debate<br><br>
31         <input type="reset" name="Reset" value="Reset">
32         <input type="submit" name="Submit" value="Submit">
33 </form></td></tr></table></body>
34 </html>
```

TYPE: Video Resource **Title:** Basic HTML Tutorial

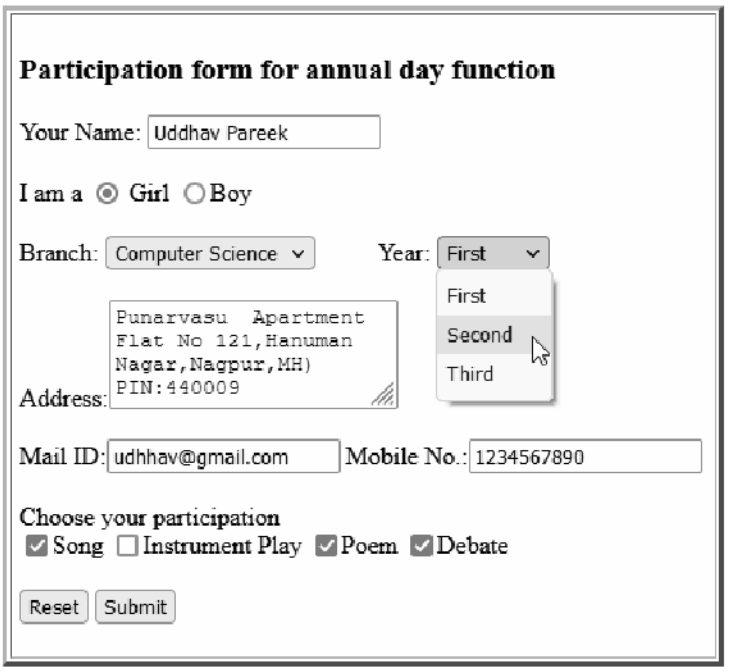


Fig. 3.14: Web Form and Components

3.2 CASCADED STYLE SHEETS (CSS)

CSS is a stylesheet language used to style the content of a webpage. CSS is the acronym for Cascading Style Sheets. The key concept behind the CSS is to separate the content and formatting information from the webpages. Thus, HTML should include content only whereas CSS files will store the styling and formatting information. CSS explains how HTML elements will be displayed on the webpage other than web browser default settings. It eliminates redundant work by defining style information once and reusing it at many places. A CSS can control the layout of multiple webpages at once. With the help of CSS, webpages load faster and become more presentable. CSS is easy to maintain and provides extended styles to HTML. Presently CSS version 3 is being used.

It is not that there are only advantages to using CSS, there are some issues associated with it too. CSS faces the problem with browser compatibility. Sometimes a webpage presented on a web browser may look very different on other web browsers.

3.2.1 Ways to Apply CSS to an HTML document

There are three ways:

1. **Inline (the attribute style):** In this way, CSS is applied directly with the style attribute. Thus, it is like specifying an attribute to an HTML tag.

   Example: To change background color of a webpage to blue, inline CSS can be applied in body tag with style attribute as: <body style= "background-color: #0000FF" > (see Table 3.13(a))

2. **Internal (the tag style):** In this way CSS is applied in the tag style. Style rule is defined between <style>..</style> tag in the <HEAD> tag of HTML document(see Table 3.13(b))

Table 3.13: Ways to Apply CSS to an HTML Document (a) Inline (b) Internal

<html> <head> </head> <body style="background-color: #00FF00;"> The background is green. </body> </html>	<html> <head> <style type="text/css" > h3 {background-color: #0000FF; color: #FFFFFF } </style> </head> <body> The background is blue and font color is white. </body>

3. **External CSS:** In this method, a separate CSS file (external) is linked to an HTML code file. HTML webpage must include a reference to the external style sheet file inside the <LINK> element, inside the <HEAD> section. Table 3.14 shows the linking of the HTML content file (external.html) to the style sheet file (mystyle.css). The file mystyle.css contains a rule to format the background color of the body tag to grey (#808080). Hence the output with grey background is shown in the browser output of Table 3.14.

An external style sheet can be written in any simple text editor and must be saved with a .css extension. The separate .css file holds all the formatting rules which can be applied to multiple webpages parallelly. Each rule begins with a selector, which states that wherever this selector is used on a webpage, the new formatting described in the ruleset will apply.

Table 3.14: Apply an External CSS to an HTML Document

File: external.html	**File: mystyle.css**

<html><head>
<link rel="stylesheet" type="text/css" href="mystyle.css" /></head>
<body>
<h1>Motivational Quote</h1>
Never fear failure. We learn more from failures than successes. Treat failures like results.<h3 align=right>- Rajyavardhan Singh Rathore</h3>
</body></html>
	body {
	background-color: #808080;
	}
	Browser Output
	Motivational Quote
	Never fear failure. We learn more from failures than successes. Treat failures like results.
	- Rajyavardhan Singh Rathore

Every ruleset has at least one declaration, enclosed within curly brackets. The declaration consists of:

Property: This refers to characteristics (like size, color) whose associated value defines how the browser is supposed to display the element.

Colon: The colon symbol (:) is segregate property and value.

Value: This is the value of the CSS declaration.

Semicolon: The semicolon symbol (;) marks the end of the declaration. We can specify multiple rules on the same selector. Fig. 3.15 shows the declaration of multiple rules for <h1> selector. The rule set has customized the <h1> tag. As a result of this ruleset, the color of the content related to all the <h1> tags of the webpage will be red and the font size will be 14 pixels.

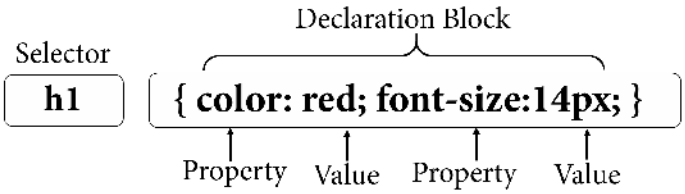


Fig. 3.15: CSS Syntax (Selector, Property, and Values)

Table 3.15: Class Selector in CSS

	(a) File: class selector.html
1	<html><head>
2	<link rel="stylesheet" type="text/css"
3	href="mystyle1.css" /></head>
4	<body>
5	<h1 id="Sports">Sports and Fitness</h1>
	The word "sport" comes from the Old French desport meaning "leisure"
6	<h3 class="fitness">a sport should have an element of competition</h3>
	</body>
	</html>

(b) File: mystyle1.css

```
.fitness{color:white; background-color:green}
```

(c) Browser Output

Sports and Fitness

The word "sport" comes from the Old French desport meaning "leisure"

a sport should have an element of competition

3.2.2 CSS Selectors

Selectors are used to finding the HTML elements that are to be styled. There are three types of selectors available in CSS namely element selector, class selector, and id selector.

1. **Element selector:** It is used to style all instances of a specific element in a webpage. It is done by choosing an element by its tag name and then style is applied to that element. Fig. 3.15 is an example of an element selector.

Table 3.16: ID Selector in CSS

	(a) File: id selector.html
1	<html><head>
2	<link rel="stylesheet" type="text/css"
3	href="mystyle2.css" /></head>
4	<body>
5	<h4 id="boxing"> People used to say that boxing is for men and not for women and I thought I will show them some day. I promised myself and I proved myself. -Mary Kom</h4>
6	<h4 id="shooting"> Practice is a talent. Perseverance is a talent. Hard work is a talent. - Abhinav Bhindra</h4>
7	</body>
8	</html>

(b) File: mystyle2.css

```
#shooting{color:blue; font-size:18px;}
```

(c) Browser Output

People used to say that boxing is for men and not for women and I thought I will show them some day. I promised myself and I proved myself.
Mary Kom

Practice is a talent. Perseverance is a talent. Hard work is a talent.
- Abhinav Bindra

2. **Class Selector:** It is used to apply the same style to all elements belonging to a specific (defined) class e.g., we applied the mystyle1.css (color:white; background-color:green) style to various elements on the webpage with class= "fitness". (See Table 3.15)
3. **ID Selector:** It is used to apply a style to a specific element in a document which can be selected by its ID e.g., we applied the mystyle2.css (color:blue; font-size:18px;) style to all the <h4> elements having ID as "shooting". Table 3.16(a) shows the use of CSS with id selector. Line 5 and 6 define <h4> elements with id name as boxing and shooting respectively. Table 3.16(b) shows the code of mystyle2.css which has one ruleset for "shooting" ID. Table 3.16(c) shows the browser output when the HTML document is opened in the web browser.

3.2.3 CSS Properties

The strength of cascading style sheets resides in the long list of its powerful properties and associated values. The use of CSS properties enables web browsers to render an aesthetically rich webpage in minimal time. CSS uses hundreds of property-value pairs to enrich web development and granular control over web elements. The most commonly used properties with examples are presented here from Table 3.17 to Table 3.19. To learn these properties practically, learners are instructed to follow any of the below methods.

Text Editor and Web Browser Method (the ultimate way)

1. Create a webpage (say content.html) with various HTML elements like different heading levels, paragraphs, lists, tables, images, etc. Thus, this content.html file will be used for our hands-on purpose.
2. Create a separate style.css file in any text editor and include the code (one code at a time) shown in the third columns of Table 3.17 to Table 3.19.
3. Apply the ruleset of this style.css file to the content.html file using "External CSS method" as we did previously (see Table.3.14)
4. Open content.html in the browser window and observe the change in the output due to the newly applied CSS rule.
5. Follow steps 2 to 4 for each example of the below Tables.

Table 3.17: CSS Font Properties

Property	Description	Example
font-family	Used to customize type of font to be shown on webpage	h1 {font-family: Courier, Prestige, monospace;} p {font-family: arial, comic sans-serif, "Times New Roman";}
font-size	Used to control the size of font Values: pixels, point etc.	h1 {font-size: 20px;} p {font-size: 14pt;}
font-style	Used to control the style of font Values: normal, italic or oblique	h2 {font-family: "Times New Roman", serif; font-style: italic;}
font-variant	Used to control the variant of font	h1 {font-variant: small-caps;} h2 {font-variant: normal;}
font-weight	Used to control the boldness of font	p {font-family: arial, verdana, sans-serif; font-weight: normal;}

Table 3.18: CSS Text Properties

Property	Description	Example
letter-spacing	Used to customize space between each letter in a section of text	h1 {letter-spacing: 6px;} p {letter-spacing: 3px;}
text-align	Used to control the alignment of a section of text Values: left, right, or center	td {text-align: center;}
text-decoration	Used to control the look of text Values: underline, overline, line-through	h1 {text-decoration: underline;}
text-indent	Used to control the indentation of first line in text	p {text-indent: 60px;}
text-transform	Used to change case of text Values: capitalize, uppercase or lowercase	li {text-transform: uppercase;}

Table 3.19: CSS Color/Background Properties

Property	Description	Example
color	Used to control color of text Values: By name, Hexadecimal, RGB values	h1 {color: #0000FF;} or h1 {color:blue;}
background-attachment	Controls the scrolling of the background	td {text-align: center;}
background-color	Used to control background's color	p {background-color: #FFCC60;}
background-image	Used to set image of background	h2 {background-image: url("tile.jpeg");}
background-repeat	Allows background image repetition patterns. Values: repeat-x, repeat-y, repeat, no-repeat	h2 {background-image: url("tile.jpeg"); background-repeat: repeat; }

Combining Properties: All the different properties can be combined in one single property. For example, to apply different properties for <p> tag following code can be used:

```
p {  font-style: italic;
     font-weight: bold;
     font-size: 40px;
     font-family: arial, sans-serif; text-align: center;
     letter-spacing: 3px;
     text-transform: capitalize;
     color: white;
     background-color: IndianRed; }
```

W3Schools Online Code Editor (the exciting way)

Learners can take benefit of the mighty online code editor of W3Schools. Users can edit their HTML & CSS source code, and view the output in their browser window. The editor can be accessed with the given URL-https://www.w3schools.com/tryit/. Learners can also take leverage of code examples available at the above given website; below QR codes also refers to some of the code examples for CSS properties.

TYPE: Webpage & Online Code Editor **Title:** CSS Basics and Tutorial

TYPE: Online Code Editor **Title:** CSS Background Color and Font Family

TYPE: Online Code Editor **Title:** CSS Text Formatting & Background

3.3 MAKING BASIC PERSONAL WEBPAGE

In our previous sections (3.1 & 3.2) we have acquired the programming skills required to build webpages with HTML4 and CSS. As building material alone is not enough to build a house, we primarily require good planning according to our needs. Similarly, in the development of a webpage(s), we should also pay attention to many questions like-

1. What is the purpose of creating the webpage?
2. Where will the web page be hosted?
3. What technology (frontend and backend) will it be built with?
4. Will it be a static webpage or dynamic one?
5. What will be the content to be shown?
6. What will be the priority and layout of the content to be shown?
7. Who will be the target audience for our webpage?

Along with these basic questions, we also have to look at some other aspects which are related to giving effective visibility to the webpage.

- The webpage design should be mobile-friendly, responsive, and fast loading.
- Proper use of CSS will apply themes, fonts, and color styles on the page elements to display webpage lucrative and having a better understanding.
- Enrich the content with icons, emojis, and infographics for effective communication of information.
- JavaScript can also be used for dynamic content representation and lucrative menu designs.

In Lab section of this book, we will create a personal web page considering all the above facts.

SUMMARY

1. HTML is a language to build webpages.
2. In HTML there are two types of tags: paired tags and singular tags.
3. An HTML document starts with <HTML> tag and contains an optional Head element and mandatory Body element.
4. HTML documents can be created with simple text editor e.g., notepad, notepad++ etc. with .htm/.html extension.
5. HTML tags are classified as structural and formatting tags.
6. HTML uses attributes to redefine the default behaviour of its tags.
7. HTML supports three types of lists i.e., unordered list, ordered list, and definition list.
8. <IMG> tag is used for adding graphic/images in HTML.

9. Anchor tags; <A>..</A> is used to create hyperlink either on text or image.
10. Form tags are used to collect information from users.
11. CSS is a stylesheet language used to make webpages more attractive(stylish).
12. There are three common ways to apply CSS to an HTML document: 1. Inline (the attribute style) 2. Internal (the tag style) and 3. External CSS
13. CSS supports various selectors namely, element selector, class selector, and ID Selector.
14. The most commonly used CSS properties are Font Properties, Text Properties, and Color/ Background Properties.

EXERCISES

A. Objective Questions

Q1. HTML stands for,

A. High Text Machine Language
B. Hypertext and links Markup Language
C. Hyper Text Markup Language
D. None of these

Q2. What is the correct order of HTML tags for making a webpage?

A. head, title, html, body
B. html, body, title, head
C. html, head, title, body
D. html, head, title, body

Q3. The HTML tags are -

A. case-sensitive
B. in upper case
C. not case sensitive
D. in lowercase

Q4. How we can insert an image to HTML?

A.
B.
C.
D.

Q5. Which attribute is used to set the color of normal text for the Webpage?

A. color
B. bgcolor
C. text
D. fontcolor

Q6. What text is used to create a hyperlink in HTML?

A. <HYPER>
B. <A>
C. <LINK>
D. None of these

Q7. The correct place in the HTML document to reference an external style sheet is –

A. In <body> section
B. In <head>section
C. Above the document
D. At the end of the document

Q8. CSS is acronym, stands for:

A. Cascaded style sheets
B. Color style sheets
C. Cascading style sheets
D. Cascading style software

Q9. Syntax to apply an external style sheet:

A. <style href = myfirst.css type= “stylesheet” >
B. <style src = "myfirst.css" >
C. <stylesheet>myfirst.css</stylesheet>
D. <link rel="stylesheet" type="text/css" href=" myfirst.css">

Q10. Correct CSS syntax is
- A. body {color:black}
- B. body:color=black
- C. {body:color=black(body}
- D. {body;color;black}

Q11. Which property is used to change the background color?
- A. color:
- B. background-color:
- C. bgcolor:
- D. None of the above

Q12. How to change the text color of an element?
- A. text-color=
- B. text-color:
- C. color:
- D. fgcolor:

Q13. What is the correct CSS syntax to bold all <p> elements?
- A. <p style="text-size:bold>
- B. p { font-weight:bold; }
- C. <p style="font-size:bold">
- D. p {text-size:bold}

Q14. How can you capitalize every word in text in the CSS?
- A. text-transform:capitalize
- B. text-transform:uppercase
- C. You can't do that with CSS
- D. None of the above

Q15. How would you select the element whose id is "main"?
- A. #main
- B. Main
- C. .main
- D. *main

B. Subjective Questions

Q1. What is HTML? Explain the structure of an HTML document with an example.

Q2. Create an HTML document with text formatting as shown below:

ARISE! AWAKE! STOP NOT UNTIL THE GOAL IS REACHED

ARISE! AWAKE! STOP NOT UNTIL THE GOAL IS REACHED

~ Swami Vivekanand

Narendra's first introduction to Ramakrishna occurred in a literature class at General Assembly's Institution when he heard Professor William Hastie lecturing on William Wordsworth's poem, **The Excursion.** While explaining the word *"trance"* in the poem, Hastie suggested that his students visit ***Ramakrishna of Dakshineswar*** to understand the true meaning of trance.

Q3. Create an HTML document to create a list of subjects being taught in your institute. Assuming there are two branches namely Computer, Mechanical. The list should look like as:

1. Computer
   a. First Year
      i Subject 1
      ii Subject 2
      iii ……. Subject N
   b. Second Year
   c. Third Year
2. Mechanical

Q4. Create a webpage as depicted in Fig. 3.7 (with another available picture). In addition, set the background color of webpage to "#ff6600" and text color to "White".

Q5. Create a webpage with hyperlinks to connect webpages created in Q. No 2 to 4. The webpage should also contain text/images hyperlink and reference some named locations on the same page.

Q6. Create an HTML form to take feedback from a customer of an eCommerce website.

Q7. Explain the difference between class selectors and ID selectors with an example.

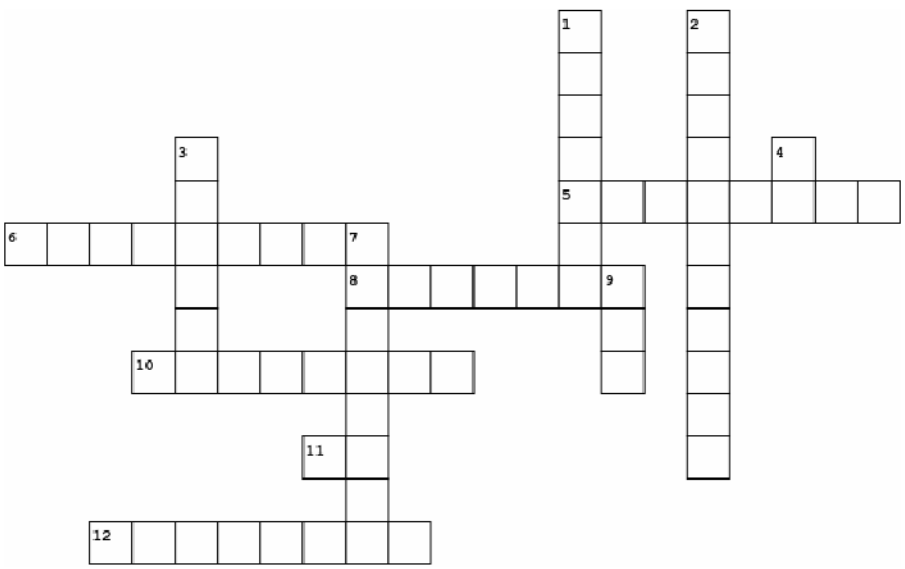
Q8. Create a CSS with the following rules:

a. Set the text color for the page to "#ff6600", and the text color for <h1> to "IndianRed".

b. Set "sample.gif" as the background image of the page.

c. Set the font family for the page to "Courier New", and the font family for <h1> to "Verdana".

C. Crossword



Across		Down	
5.	refers to characteristics to display an element on the browser	1.	is an attribute that indicates the browser to take up space more than one column
6.	is a text that also contains linking information	2.	an attribute used to specify the distance between data and boundaries of the cell
8.	the portion of html documents from starting tag up to the corresponding closing tag is known as	3.	name of a browser
10.	is used to finding the HTML elements that are to be styled	4.	a tag to draw a horizontal line in an HTML document
11.	a tag to insert a new line in an HTML document	7.	is a form component used to take multiple line input from the user
12.	a tag without a companion tag is known as	9.	is a special word enclosed within angular brackets

ANSWERS

A. Objective Questions

Q.N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Option	C	D	C	D	C	B	B	A	D	A	B	C	B	B	A

B. Hints for Subjective Questions

A1. HTML stands for Hypertext Markup Language; it is used to make a Webpages for web browsers. An HTML document starts with <HTML> tag and contains an optional Head element and mandatory Body element. The structure is discussed in Fig.2(a).

A2.

```
<body >
 <center>
 <h2>ARISE! AWAKE! STOP NOT UNTIL TIIE GOAL IS REACIIED</h2>
 <h3>ARISE! AWAKE! STOP NOT UNTIL THE GOAL IS REACHED</h3>
 </center>
 <i><II3 ALIGN=right>~ Swami Vivekanand</II3></i><hr>
 <P>Narendra's first introduction to Ramakrishna occurred in a literature class at General Assembly's
Institution when he heard Professor William Hastie lecturing on William Wordsworth's poem,
<b>The Excursion. </b> While explaining the word <i>"trance"</i> in the poem, Hastie suggested
that his students visit <u><b><i>Ramakrishna of Dakshineswar</i></b></u> to understand the true
meaning of trance. </p>
</body>
```

A3.

```
<body>
    <h4>Branche and Subjects</h4>
        <ol>
            <li>Computer
                <ol type=a>
                    <li>First Year</li>
                        <ol type=i>
                            <li>SUB1</li>
                            <li>SUB2</li>
                        </ol>
                    <li>Second Year</li>
                </ol>
            </li>
            <li>Mechanical</li>
        </ol>
    </body>
```

A4. In addition to Fig. 3.6, include attribute bgcolor=#ff6600 and text=white for Body tag.

A5. Use <A>..</A> tag as discussed in Fig. 3.12.

A6. Create an HTML form as discussed in Fig 3.14

A7. The class selector is used to apply the same style to all elements belonging to a defined class. ID Selector is used to applying a style to a specific element in a document that can be selected by its ID. (see Table 3.15 & Table 3.16)

A8.

```
<head><style>
body{ font-family: "Courier New"; color: #ff6600; background-image: url("sample.gif");}
h1 { font-family: Verdana; color: IndianRed; }
</style></head>
<body>
<h1>This is a Heading</h1>
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
</body>
```

C. Crossword

Across: 5-property, 6-hypertext, 8-element, 10-selector, 11Ivan Bayross, br, 12-singular
Down: 1-colspan, 2-cellpadding, 3-chrome, 4-hr, 7-textarea, 9-tag

KNOW MORE

1. Demonstrate to the students the use of different editors. Like notepad, notepad++, to create HTML documents.
2. Creating a webpage in ubuntu or any other Linux distribution is also worthful.
3. Teachers should encourage students to write clean HTML codes which can be run on different platforms and browsers. To make them equipped, try to check your code on any online HTML validation services. The W3C Markup Validation Service is one such service to validate our code by giving the URI of our HTML document, uploading a document, or directly pasting code on a given text area. Refer to https://validator.w3.org/
4. A useful WYSIWYG online HTML code editor URL: https://wordhtml.com/
5. Mozilla developer network has developed a user-friendly CSS reference to find all standard CSS properties and other programming constructs. You may visit below URL: https://developer.mozilla.org/en-US/ docs/Web/CSS/Reference.

Applications

Some definite applications of HTML and CSS, is web application, web site or portal development. It also envisages its application in different real-life domains such as digital advertising, E-Commerce, publishing, multi-player online gaming site, backend services such as messaging, blogging, bulletin board, forums, collaboration, real-time monitoring services and real-time data updation.

Case Study: Design a web site for your college/ or Subject tutorial

First step involved in the web site development is content collection and organization. In the development phase teacher and students should discuss the content to be added to the site. List out the college specific services or features to be included in website, and for each feature, design menus and submenu options. Prepare content for each web page under a menu, along with set of images or picture gallery.

PRACTICALS

Experiment 3.1: Hyper Text Marup Language

Practical Statement

Practice HTML commands, try them with various values, make your own Webpage.

Practical Significance

HTML is a markup language used for creating web pages and web applications. Nowadays that online services are expanding for daily essential services as well, by taking advantage of this, we can also create online solutions for our needs and domain. The process of creating web pages will also make internet surfing and searching easier. As HTML programming is a fundamental skill for web development it is significant to be versed with it.

Relevant Theory

Introduction to HTML, structure of an HTML document, process to create a webpage, various HTML tags, use of graphics and tables, hyperlinking of web resources, and HTML web forms are explained in unit 3, section 3.1.

Practical Outcomes (PrO)

The learners will be able to:

PrO1: create a webpage with basic formatting tags, graphics, and table.

PrO2: create a personal webpage with various formatting, listing, hyperlinking and graphics tags.

Practical Setup (Work Situation)

We will write HTML programs for two scenarios mentioned in practical outcomes.

Scenario 1: Create a webpage having HTML table to display the department wise list of faculties.

Scenario 2: Create a personal webpage to show your basic details, objective, work experiences, skills, and social media handles. Webpage should have the use of basic formatting tags, ordered and unordered lists, graphics, text, and image hyperlinks.

Resources Required

1. A computer system i.e., PC/Laptop.
2. A normal text editor software i.e., notepad, notepad++, etc.
3. An installed web browser software i.e., Mozilla Firefox, Google Chrome, Microsoft Edge, etc.

Precautions

Always write clean HTML code (the code with proper end tags, spacing, nesting & which follow standards) that can run on different platforms and browsers.

Suggested Procedure

Follow these steps to create and run an HTML webpage.

1. Open any text editor of your choice. and type the source code of your HTML program (source code for both scenarios are mentioned in Table 3.20).
2. Now we have to save this file with a .htm or .html extension. To do so, click on the Files → "save as" option. It will show Save as dialog box (refer to unit 3, Fig. 3.2(b)). We have to select the "All Files (*)" list option from Save as type.
3. Now change the name of the current file from 'Untitled.txt' to 'myWebpage.html' and click on the Save option. The icon of the current file will change to your default browser's icon.
4. The saved file can be now opened in any web browser using one of the below methods.
   a. Just browse the file and double-click on the file, it will be opened in the default browser.
   b. Open your browser, press Ctrl + 'O' keys, and select file by browsing its location.
   c. Open your browser and 'Drag & Drop' your html/htm file on the browser window.

Table 3.20: Source Code and Output for Scenario 1

```
<html>
<head> Dept_Wise Faculties</head>
<body> <table style="background-color: khaki;" border="2" width="510">
<tr><td style="text-align: center;" colspan="4" width="510">
<p style="text-align: center;"><b>Computer Department</b></p></td></tr>
<tr><td style="text-align: center;" width="47"><p>S.No</p></td>
<td style="text-align: center;" width="85"><p>Photo</p></td>
<td style="text-align: center;" width="198"><p>Faculty Name &amp;amp; Designation</p>
</td><td style="text-align: center;" width="180"><p>Contact Information</p></td></tr>
<tr><td style="text-align: center;" width="47"><p>1.</p></td>
<td style="text-align: center;" width="85"> <img src="https://www.lcbishnoi.in/images/
lcbishnoi.jpg" alt="DrLCB" width="70" height="67" /></td>
<td style="text-align: center;" width="198">
<p>Dr. L. C. Bishnoi, HOD</p></td>
<td style="text-align: center;" width="180">
<p>LC.bishnoi@rajasthan.gov.in</p><p>https://www.lcbishnoi.in/</p></td></tr>
<tr><td style="text-align: center;" width="47"><p>..</p>
</td><td style="text-align: center;" width="85"><p>..</p></td>
<td style="text-align: center;" width="198"><p>..</p></td>
<td style="text-align: center;" width="180"><p>..</p>
</td></tr>
<tr><td style="text-align: center;" colspan="4" width="510">
<p style="text-align: center;"><b>Mechanical Department</b></p></td></tr>
<tr><td style="text-align: center;" width="47"><p>1</p></td>
<td style="text-align: center;" width="85"> </td>
```

```
<td style="text-align: center;" width="198"><p>Er. Sanjay Sharma, HOD</p></td>
<td style="text-align: center;" width="180"><p>sanjay.jns1970@gmail.com</p></td></tr>
</table>
</body>
</html>
```

Output Scenerio 1:

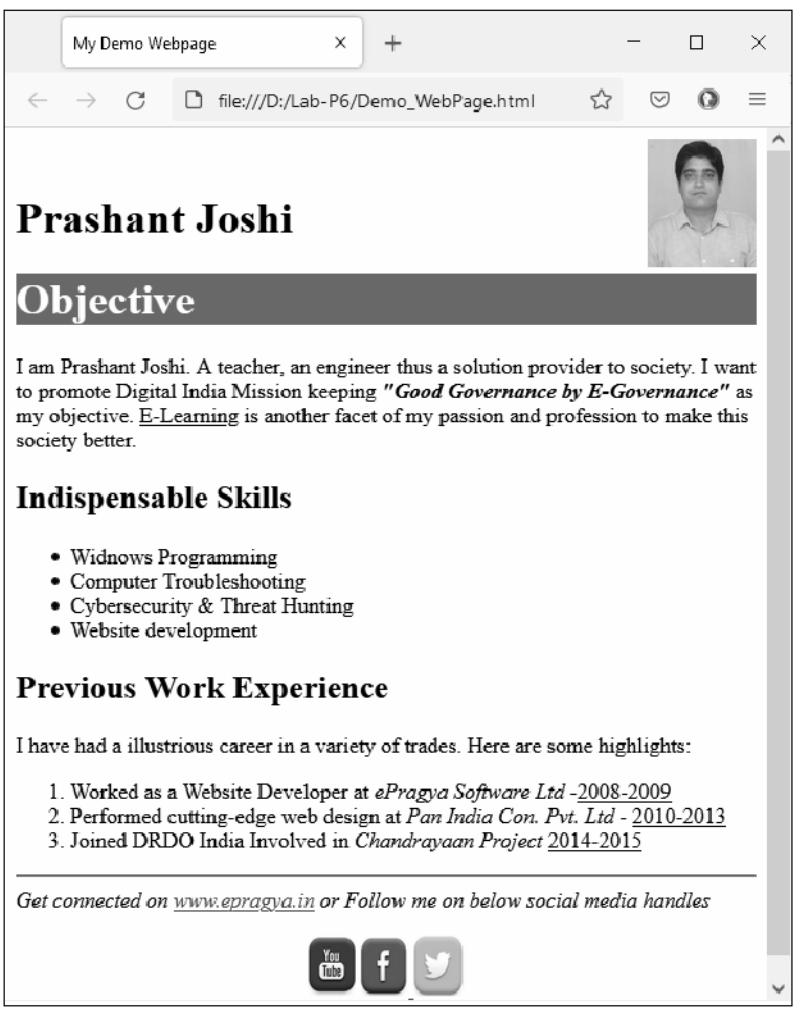
Computer Department			
S.No	Photo	Faculty Name & Designation	Contact Information
1.		Dr. L. C. Bishnoi, HOD	LC.bishnoi@rajasthan.gov.in https://www.lcbishnoi.in/
..	..	..	..
Mechanical Department			
1		Er. Sanjay Sharma, HOD	sanjay.jns1970@gmail.com

Table 3.21: Source Code and Output for Scenario 2

```
<html>
<head>  <title>My Demo Webpage</title>
</head>
<body >
<img src="PJoshi.jpeg" align=right width="80" height=95><br>
<h1>Prashant Joshi</h1>
<h1 style="background-color:IndianRed;color:white;">Objective</h1>
<p>I am Prashant Joshi. A teacher, an engineer thus a solution provider to society. I want to promote
Digital India Mission keeping <b><i>"Good Governance by E-Governance"</i></b> as my objective.
<u>E-Learning</u> is another facet of my passion and profession to make this society better.</p>
<h2>Indispensable Skills</h2>
<ul>
  <li>Widnows Programming</li> <li>Computer Troubleshooting</li>
  <li>Cybersecurity & Threat Hunting</li> <li>Website development</li> </ul>
<h2 >Previous Work Experience</h2>
<p>I have had a illustrious career in a variety of trades. Here are some highlights:</p>
<ol>  <li>Worked as a Website Developer at <i>ePragya Software Ltd  </i>-<u>2008-2009</u></li>
  <li>Performed cutting-edge web design at <i>Pan India Con. Pvt. Ltd </i>- <u>2010-
      2013</u></li>
  <li>Joined DRDO India Involved in<i> Chandrayaan Project</i> <u>2014-2015</u></li>
</ol><hr>
<i>Get connected on <a href="www.epragya.in" target="_blank"> www.epragya.in</a> or Follow me
```

```
on below social media handles</i>
<p align=center> <a href="https://www.youtube.com/c/ePragya" target="_blank">
<img src="https://drive.google.com/thumbnail?id=1OmCcznYdWRlq5kgBMs8a9eCPclW3P78B"
width="35" height="45"></a>
<a href="https://www.facebook.com/ErPrashantJoshi/" target="_blank">
<img src="https://drive.google.com/thumbnail?id=1BRdjb3m2SbmYyPunQHO83Qtr_axTpoQp"
width="35" height="45"></a>
<a href="https://twitter.com/PrashantJosh1" target="_blank">
<img src="https://drive.google.com/thumbnail?id=1cSNqC4G5_s0I5IHihmeV6vuBz9vW9E2C"
width="38" height="45"> </a></p>
</body>
</html>
```

Output Scenario 2:



Observations

Table 3.22: HTML Tags and Attribute used in Both Scenarios

Sr. No	Scenario	Name of HTML Tag	Attribute	Description
1.				

Practical Related Questions

1. How we can change the color of the table border?
2. What is the use of "rowspan" and "colspan"?
3. What types of hyperlinks can be created in HTML programs?

Suggested Learning Resources

[1] I. Bayross, *Web enabled commercial applications development using ... HTML, DHTML, Javascript, Perl CGI [with CD].*, 3rd ed. New Delhi: BPB Publication, 2005.

[2] W3Schools, "HTML Tutorial," *W3schools.com*, 2019. www.w3schools.com/html/default.asp.

Suggested Assessment Scheme

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Explanation of practical components i.e., section 1.2 to 1.7	10	
2.	Clean source code, and step-by-step explanation.	25	
3.	Viva voce	15	
Process Related: ..... Marks* (.....%)			
4.	Source code & It's output	25	
5.	Preparation of observation tables	15	
6.	Explanation of observation tables & interpretation made	10	
	Total	**100%**	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... **Marks Awarded**			**Signature of Teacher with date**
Process Related	Product Related	Total	

REFERENCES AND SUGGESTED READINGS

[1] *Information and Computer Technology*, 1st ed. Delhi, India: CBSE.

[2] NCERT, *Information and communication technology : Textbook for class IX*. New Delhi: National Council of Educational Research And Training, 2019.

[3] "QR Codes Content," *digital.nios.ac.in*. http://digital.nios.ac.in/topic.php?id=330en24 (accessed Aug. 19, 2021).

[4] I. Bayross, *Web enabled commercial applications development using ... HTML, DHTML, Javascript, Perl CGI [with CD]*., 3rd ed. New Delhi: BPB Publication, 2005.

[5] W3Schools, "HTML Tutorial," *W3schools.com*, 2019. www.w3schools.com/html/default.asp

[6] W3Schools, "CSS Tutorial," *W3schools.com*, 2019. www.w3schools.com/css/default.asp.

❑❑❑

4 Open Office Tools

UNIT SPECIFICS

In this unit, learners will learn and practice different open-source programs of Apache Open Office (AOO) software. Unit includes AOO's Writer program used for basic word processing tasks, CALC program for manipulating tabular data in form of spreadsheets and Impress program for presentation preparation. Adequate practice of these programs will surely enhance basic software skills of learners.

RATIONALE

It is well known that IT systems are used for information display to advanced data processing and research tasks. But if we look at the uses happening around us, it is being used in abundance in office suite tasks like word processing tasks, calculation tasks, presentation tasks, etc. Therefore, it is necessary to study such software in use for these office suite functions.

OpenOffice is an open-source software suite that can runs on several hardware architectures and various operating systems such as Microsoft Windows, Mac OS X, Linux, and Sun Solaris. OpenOffice includes various tools e.g., Writer (word processor), Calc (spreadsheet), Impress (presentations), drawing application (draw), a formula editor (math), and a database management application (base). All these components are well integrated and commonly referred as OpenOffice tools.

PRE-REQUISITES

- Fundamental knowledge of computer systems.
- Basic knowledge of working with Windows or Unix OS environments.

UNIT OUTCOMES

Learners will be able to:

U4-O1: Install OpenOffice software and define features of its programs i.e., Writer, Calc, and Impress.

U4-O2: Use Writer interface and perform word processing tasks.

U4-O3: Use Calc interface and perform calculative tasks of spreadsheet programs.

U4-O4: Use Impress interface and prepare impactful presentations.

Table 4.1: Mapping of Unit Outcomes with the Course Outcomes

Unit-4 Outcome	EXPECTED MAPPING WITH COURSE OUTCOMES *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*						
	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
U4-O1	2	2	1	1	2	3	1
U4-O2	2	1	1	1	3	3	1
U4-O3	2	1	1	1	1	3	1
U4-O4	2	1	1	1	3	3	1

4.1 INSTALLATION OF OPENOFFICE

The mission of OpenOffice developers is to create an office suite software community that will run on all major platforms. We can leverage the various programs of OpenOffice by installing the software on our computer system. To install OpenOffice, it is recommended to go through the system requirements. Depending on the hardware and operating system of our computer system, we should download and install the package from the OpenOffice project's home page. The following steps describe the process to install Apache OpenOffice (AOO):

1. First of all, we need to download the current version from the OpenOffice website i.e., *https://www.openoffice.org/download/index.html*
2. On the above webpage, we have to choose appropriate options for the operating systems, language, and version of the OpenOffice package to be downloaded. Other than various international languages, Apache OpenOffice is also available in Hindi and Tamil languages. Click on the 'Download full installation' button. A full installation file, sized about 135 MB will be downloaded (see Fig. 4.1).

Fig. 4.1: Download Apache OpenOffice

3. Start the installation with the downloaded file in the previous step. As depicted in Fig. 4.2(a) an installation wizard will appear to guide the installation process. By clicking Next, we will be shown a window to choose the installation location. Click on the Install button. The installation process will begin and show some installing information via intermediate screens.

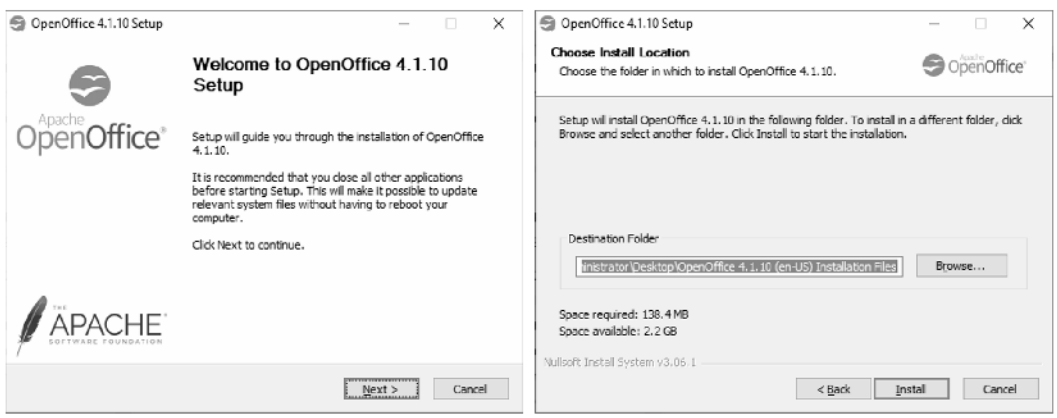


Fig. 4.2: Installation Wizard Screens (a) Welcome Screen (b) Install Location

4. Next, a 'Customer Information' form will be presented to take complete customer Information. After filling the form click on Next and then another window will be presented to choose setup type. Click Next, after setup type selection. (see Fig. 4.3)

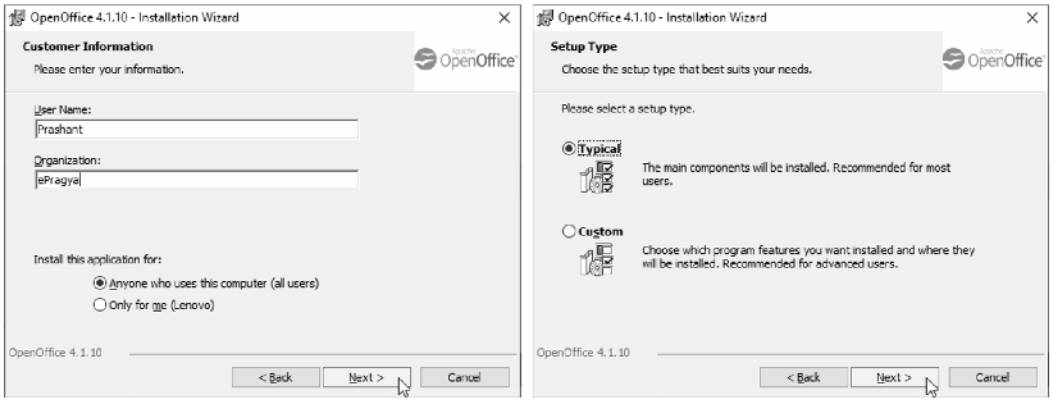


Fig. 4.3: Installation Wizard Screens (a) Customer Information (b) Setup Type Selection

5. The window depicted in Fig. 4.4(a) will be shown. Click on the Install button to begin the installation process. After some time, the OpenOffice installation completed wizard appears then Click on Finish. (See Fig. 4.4(b))

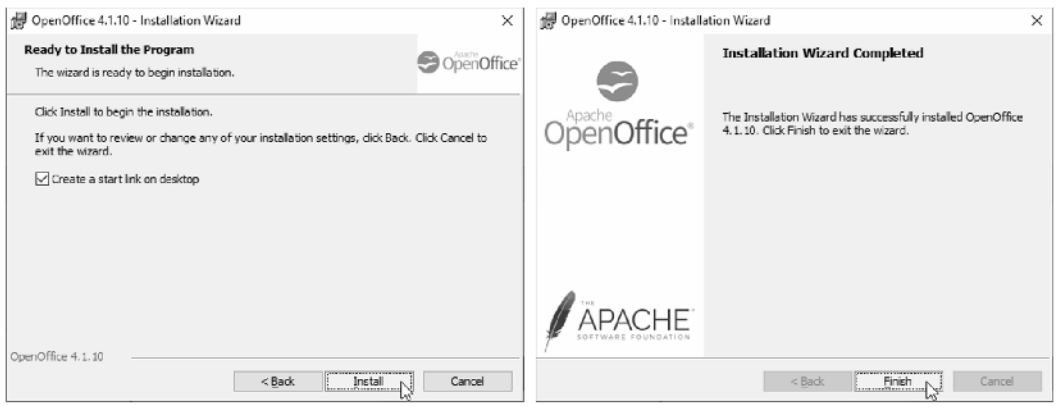


Fig. 4.4: Installation Wizard Screens (a) Begin Installation (b) Finish Installation

6. Now, we will have a start link on desktop. We can open the OpenOffice4 by double-clicking the link. Initial screen with all the OpenOffice programs will be shown as depicted in Fig. 4.5.

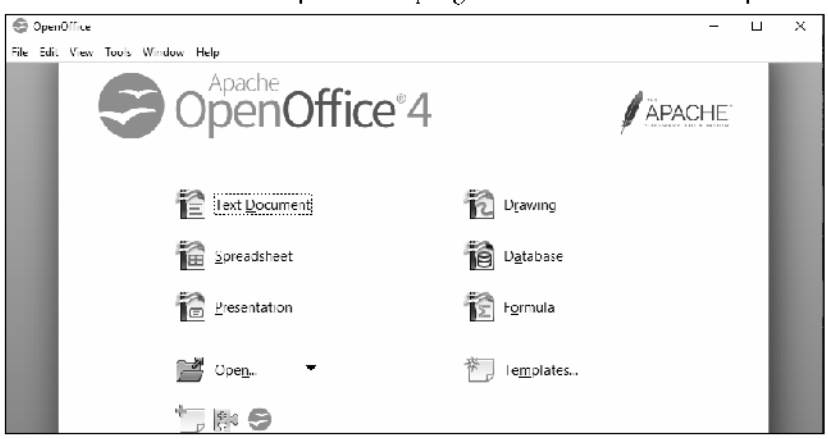


Fig. 4.5: OpenOffice Start Center

The Advantages of OpenOffice

OpenOffice software possesses several benefits over other office suite counterparts. Some of these are:

1. **No licensing fees:** It's free software. Anyone can use and distribute it without any charges.
2. **Open source:** Source code is openly available. Users can distribute, copy and modify the software as per the AOO's Open-source licenses.
3. **Cross-platform:** The software can be installed in several hardware architectures and under multiple operating systems.
4. **Extensive language support:** Its user interface is available in more than 40 languages including Hindi, Tamil, etc. It also supports spelling, hyphenation, and thesaurus dictionaries in over 70 languages.
5. **Consistent interface:** Provides user interfaces with a similar look and feel for better administration.
6. **Integration:** AOO's components are integrated e.g., spelling checker is used consistently across the suite. Drawing tools available in Writer are also usable in Calc, Impress and Draw.
7. **Granularity:** AOO options can be set at the component level or even document level.
8. **File compatibility:** In addition to its native OpenDocument formats, AOO includes PDF and Flash export capabilities, as well as support for opening and saving files in many common formats including Microsoft Office, HTML, XML, etc. It also includes the ability to import and edit some PDF files.
9. **No vendor lock-in:** Supports Open Document format i.e., an XML, it can be opened in any text editor.
10. **Community support:** Worldwide community to fix the software issues and software enhancement.

4.2 OPENOFFICE WRITER

The writer is the word processor component of Apache OpenOffice (AOO). It is a free alternative to Windows MS Word. The writer has all features we expect from a modern, fully equipped word processor. Using writer, we can create documents such as reports, letters, create complete books with contents, diagrams, indexes, agendas, minutes, or carrying out more complex tasks such as mail merges. It provides the usual features of a word processor: enter and edit text, spelling check, thesaurus, hyphenation, autocorrect, find and replace, automatic generation of tables of contents and indexes, mail merge, and others. In addition, the Writer provides these important features:

- Templates and styles
- Page-layout methods, including frames, columns, and tables
- Embedding or linking of graphics, spreadsheets, and other objects
- Built-in drawing tools
- Master documents—to group a collection of documents into a single document
- Change tracking during revisions
- Database integration, including a bibliography database
- Export to PDF, including bookmarks

4.2.1 Parts of Writer Interface

The Writer interface is depicted in Fig. 4.6. Features of the Writer interface are described below.

Title Bar

It is situated at the top of the Writer window and shows the file name of the current document. Fig 4.6 shows the Title Bar on top having Chapter4_Wirtre_Interface.odt as the file name.

Menu Bar

The menu bar is just below the title bar having various menus. When a menu is clicked it dropdowns and displays several commands. We will discuss one by one each such menu.

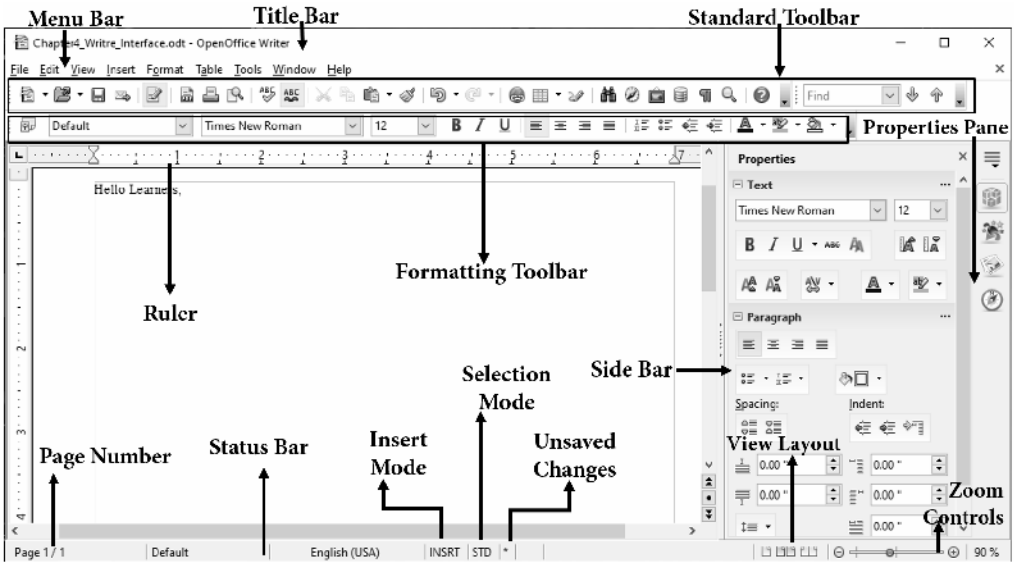


Fig. 4.6: OpenOffice Writer Interface

1. **File Menu** contains commands which apply to the entire document such as Open, Close, Save As, Digital Signature, Print, and Export as PDF. Dropdown menu with various commands is depicted in Fig. 4.7(a).
2. **Edit Menu** contains commands which apply to the entire document such as Undo, Repeat, Auto Text, Find and Replace. It also contains commands to cut, copy and paste the contents of your document. The Dropdown menu with various commands is depicted in Fig. 4.7(b).
3. **View Menu** contains commands which control the display of documents such as print layout, web layout, Fullscreen view, Zoom control, etc. It also can show/hide various toolbars on the main window. The Dropdown menu with various commands is depicted in Fig. 4.8(a).
4. **Insert Menu** contains commands for inserting elements into header, footers, and pictures in the document. It also has commands to insert manual breaks, special characters, sections, hyperlinks, bookmarks, and cross-reference. Frames, objects, Movies, and sound can also be inserted with corresponding commands. The Dropdown menu with various commands is depicted in Fig. 4.8(b).
5. **Format Menu** contains formatting layout commands for our documents using Styles, Formatting, Paragraph, Bullets, and Numbering options. The Dropdown menu with various commands is depicted in Fig. 4.9(a).
6. **Table Menu** contains commands about manipulation of table structure e.g., insert, delete, merge, split, select. In addition, it also contains content formatting commands like AutoFormat, Autofit, sorting, etc. The Dropdown menu with various commands is depicted in Fig. 4.9(b).

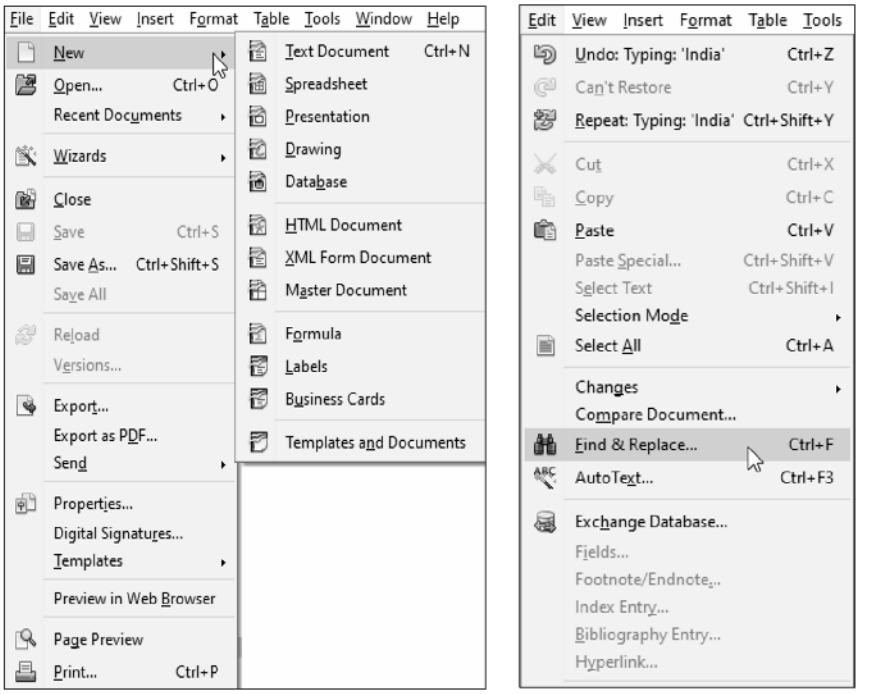


Fig. 4.7: Writer Interface Menus (a) File Menu (b) Edit Menu

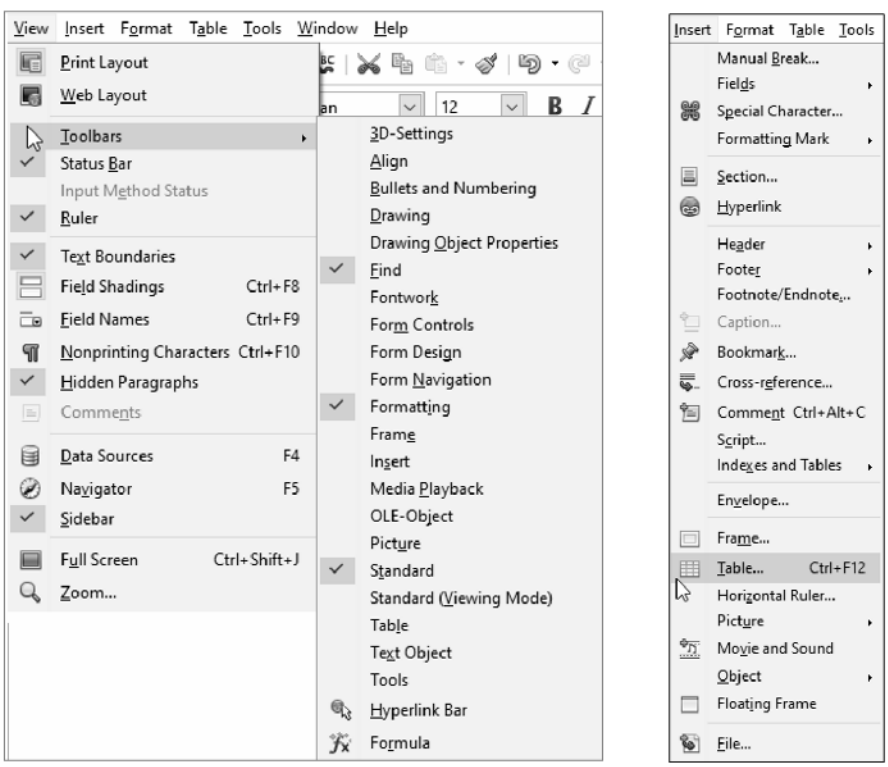


Fig. 4.8: Writer Interface Menus (a) View Menu (b) Insert Menu

7. **Tools Menu** contains various utility functions like Spelling and Grammar, Mail Merge Wizard, AutoCorrect, and Options. The Dropdown menu with various commands is depicted in Fig. 4.9(c).
8. **Window Menu** contains various commands to control the display of various opened writer windows. The new window command opens another window whereas the close command closes the current document. A list of opened documents can also be presented to switch between the documents.
9. **Help Menu** contains link to open the AOO help file. Update options check for any available update for the software. It also gives information about the version and license information of the program.

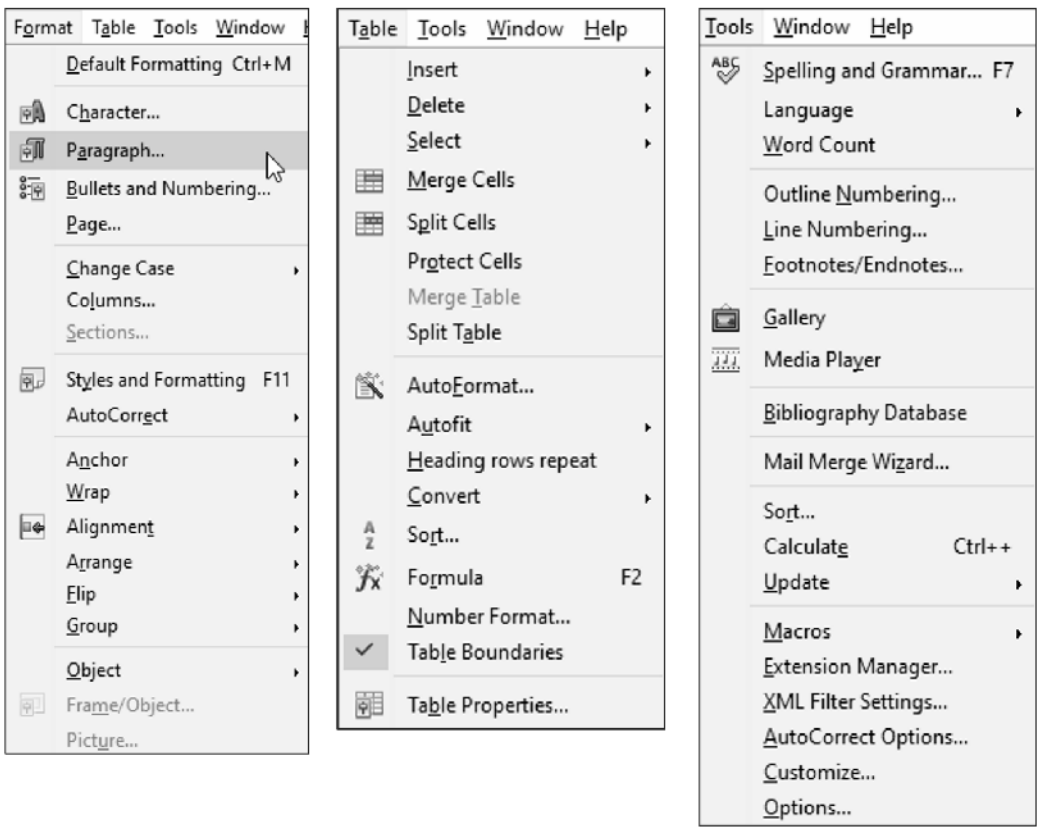


Fig. 4.9: Writer Interface Menus (a) Format Menu (b) Table Menu (c) Tools Menu

Toolbars

As per mobility of toolbars, the writer supports several toolbars i.e., docked, floating, and tear-off toolbar. A **docked toolbar** is fixed by default but it can be moved to different locations. The standard toolbar as depicted in Fig. 4.6 is a docked toolbar. The standard toolbar is also available in Calc, Impress and Draw programs of AOO. **Floating toolbars** are context-sensitive. It appears as per the current cursor position or selection. For example, when the cursor resides in a table then it will show controls about the table whereas, in the case of a bulleted list, it will show controls about bullets and numbering. The second toolbar at the top i.e., the formatting toolbar is an example floating toolbar in AOO. Tear-off toolbars can be opened via a triangle on toolbar icons as shown in Fig. 4.10. We may hide or move various toolbars as listed below:

- To display or hide toolbars, choose View → Toolbars, then click on the name of a toolbar in the list as shown in Fig. 4.8(a).
- To move a docked toolbar, place the mouse pointer over the toolbar handle, hold down the left mouse button, drag the toolbar to the new location, and then release the mouse button.
- To move a floating toolbar, click on its title bar and drag it to a new location.

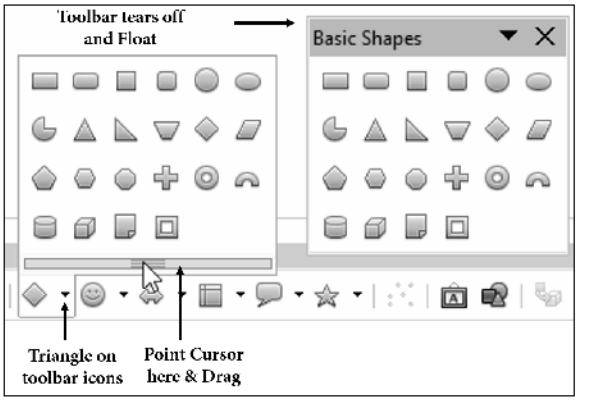


Fig. 4.10: An Example of Tear-off Toolbar

Right-click (context) menus

Users can right-click on a paragraph, graphic, or other objects to open a context menu. It is the fastest and easiest way to reach a function of the right-clicked object. If you're not sure where in the menus or toolbars a function is located, you can often find it by right-clicking.

Rulers

Rulers are used to control and see page margins, paragraph indents, and various alignment of writer objects. It can be shown or hidden via ruler check mark in view menu as depicted in Fig. 4.8(a). To enable the vertical ruler, navigate to Tools → Options → OpenOffice.org Writer → View and select Vertical ruler.

Status bar

The Writer status bar is located at the bottom of the workspace. It provides information about the document and convenient ways to quickly change some document features. It is shown at the bottom of Fig. 4.6. It contains page number, page style, language, writer mode, file save status, digital signature, document view layout, page zoom controls, etc.

4.2.2 Starting a Document

There are many ways to open a fresh text document in AOO Writer.

1. *Via Operating system Menu:*
   - We can open any AOO program by using the operating system menu. To do so, open the application by selecting Start → Programs → Writer or "Impress, Cal &Draw".
   - Alternatively, you may just hit the windows key/ search button on the bottom right corner of windows10 and simply type "writer"; it will show an icon for the OpenOffice Writer App; On Clicking the icon, we will have a new document opened.

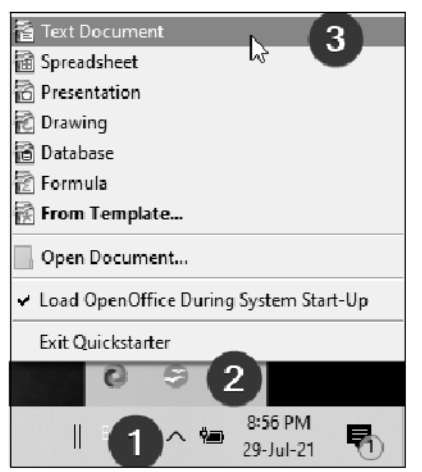


Fig. 4.11: Open New Document via Quick Starter

2. ***Via QuickStarter:*** We can use this method to open a fresh document. For the purpose we have to enable this feature one time by Tools Menu → Options → OpenOffice → Memory → OpenOffice QuickStarter. We can use QuickStarter icon at bottom right side of taskbar as depicted in Fig. 4.11.
3. ***Via Start Center:*** Open Start Center by clicking on the OpenOffice icon (either on desktop shortcut icon or by Start → Programs → OpenOffice App). Now we can open a new document with the start center option "Text Document" (see Fig. 4.5) or by Templates.. → New Document.
4. ***Via File Menu:*** If a document is opened and we want another to open, then the option of the File menu → New → Text Document (Shortcut Key Ctrl + N) can be used. (See Fig. 4.7)

4.2.3 Opening a Document

An already created document can be opened in several ways.

1. **Via QuickStarter:** Open QuickStarter by the method shown in Fig. 4.11 and then click on the open document. It will show an open dialog box to browse for the desired file to be open.
2. **Via Start Center:** Open Start Center by clicking on the OpenOffice icon (either on the desktop shortcut icon or by Start → Programs → OpenOffice App).
   - Click on the Open… icon, shown in the start center. See Fig. 4.12
   - We can open from a list of recent documents as shown in Fig. 4.12.
   - The document can also be open from the menu option File → Open (shortcut key Ctrl + O)
   - Recent Documents list of the File menu

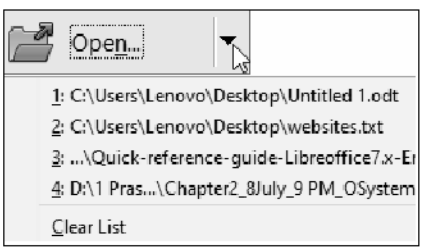


Fig. 4.12: Open Document with Start Center

The above methods are also applicable if one document is opened and we want another to open.

4.2.4 Saving a Document

A newly created document can be saved in many ways.

- Select File → Save (See Fig. 4.7(a))
- Select File → Save As
- Click on the Save Icon (floppy icon) on the standard toolbar.
- Short cut key Ctrl + S

When we apply any of the above actions, a save as dialog box will open. We have to provide the name of the file, its type, and the location where we want to save the file. We can save a document in various supported formats. (See Fig. 4.13)

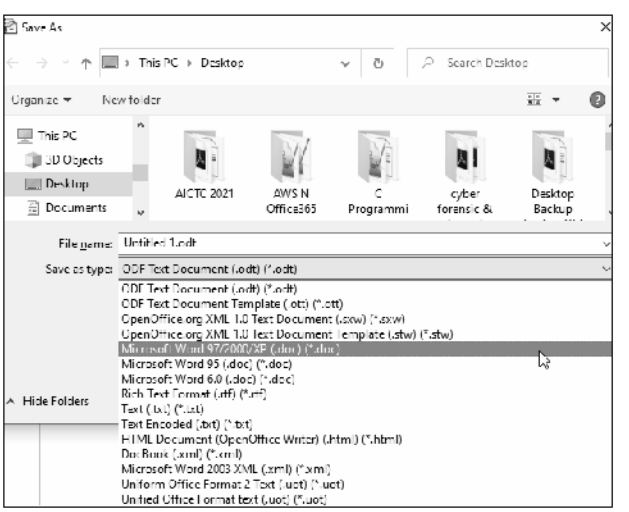


Fig. 4.13: Save as Dialog Box

4.2.5 Closing a Document

A document can be closed in many ways.

- Select File → Close
- Cross Icon at right most of Menu Bar

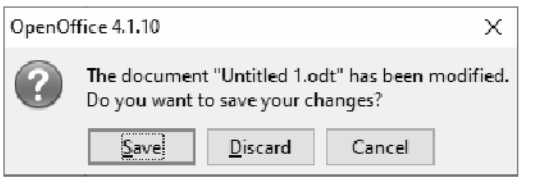


Fig. 4.14: Document Modified Dialog box

If our document is not saved after the last modification then it will alert us and display a Dialog Box as shown in Fig. 4.14. Click on save to save the modifications. Select Discard if do not want to save the last modifications and select cancel if you want to work on the document again.

4.2.6 Printing a Document

1. **Quick Printing:** This option can be utilized to quickly send a document to your default printer. Click on the "Print File Directly (Default printer name)" icon on the standard toolbar.
2. **Controlled Printing:** It is a customized printing option. We can set parameters for printing. To execute this command, select File → Print or Keyboard shortcut Ctrl + P will open a print dialog box as shown in Fig. 4.15. We have to provide our printing preferences like page range to be print, printer name, number of copies, order of printing, page setup, quality of printing, layout (pages per sheet), etc. Then click on the Print button.

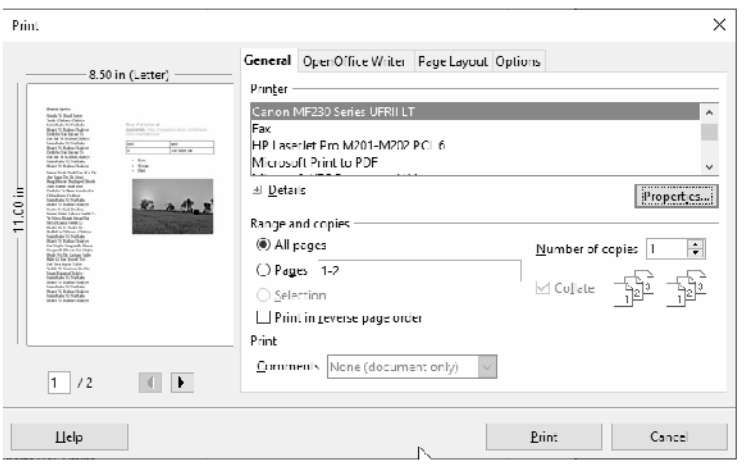


Fig. 4.15: Print Dialog Box

4.2.7 Selection, Cutting, and Pasting in a Document

Selection, Cut, and Paste operation in the AOO Writer application is the same as in other applications of a computer system. We can use mouse, keyboard, menu commands to perform these operations. Text can be copied within the document or between various other documents.

To cut or copy (with text selected) you can use:

- Keyboard shortcuts: Control + X (cut) or Control + C (copy)
- Menu selections: Edit → Cut or Edit → Copy
- Contextual menus: Right-click text selection and choose Cut or Copy
- Icon sources: Cut or Copy

Pasting text places, the cut or copied text in the document. When pasting text, the formatting result depends on the source and how you paste it. To paste and retain original formatting use:

- Keyboard shortcut: Control + V
- Menu selection: Edit → Paste
- Contextual menu: Right-click and choose Paste
- Icon Source: Paste

4.2.8 Character Formatting

We can apply many formats at the character level using the command buttons on the Formatting toolbar. The Formatting toolbar is shown below (Fig. 4.16) as a floating toolbar, customized to show only the icons for character formatting.

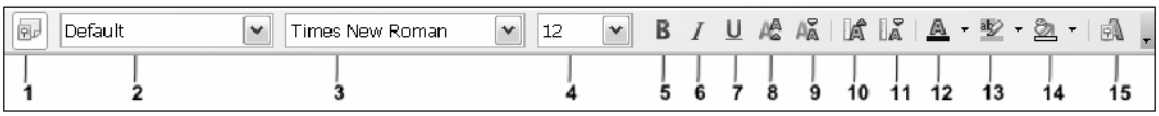


Fig. 4.16: Formatting Toolbar Showing Icons for Character Formatting

1. Styles and Formatting window
2. Apply Style
3. Font Name
4. Font Size
5. Bold
6. Italic
7. Underline
8. Superscript
9. Subscript
10. Increase Font
11. Reduce Font
12. Font Color
13. Highlighting
14 Background Color
15 Character Format dialog

4.2.9 Paragraph Formatting

You can apply many formats to paragraphs using the buttons on the Formatting toolbar. The Formatting toolbar is shown below (Fig. 4.17) as a floating toolbar, customized to show only the buttons for paragraph formatting.

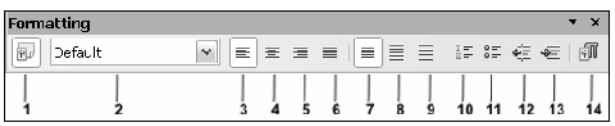


Fig. 4.17: Formatting Toolbar Showing Icons for Paragraph Formatting

1. Styles and Formatting window
2. Apply Style
3. Align Left
4. Centered
5. Align Right
6. Justified
7. Line Spacing: 1
8. Line Spacing: 1.5
9. Line Spacing: 2
10. Numbering On/Off
11. Bullets On/Off
12. Decrease Indent
13. Increase Indent
14. Paragraph Format dialog

4.2.10 Finding and Replacing of Text

The writer program supports the facility to find a specific text and replace it with other text with its "Find & Replace" dialog box. The dialog box can be opened via the standard toolbar's binocular icon or Ctrl + F Keys or Edit Menu → Find & Replace command (see Fig. 4.18).

The Find & Replace dialog can be utilized for various search tasks as described below:

- Find and replace words and phrases
- Use wildcards and regular expressions to fine-tune a search
- Find and replace specific formatting
- Find and replace paragraph styles

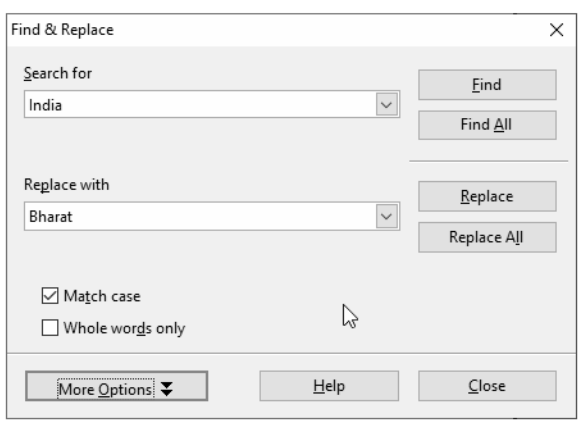


Fig. 4.18: Find & Replace Dialog Box

The Find & Replace process is performed as:

1. Type the text you want to find in the Search for box.
2. Type the new text in the Replace with box.
3. You can select various options such as matching the case, matching whole words only, or doing a search for similar words.
4. When you have set up your search, click Find. To replace text, click Replace instead.

4.2.11 Spelling and Grammar Checking

The Writer provides a spelling and grammar checking facility, accessed via Tools → Spelling (See Fig. 4.9(c)) and Grammar or F7 shortcut Key or by clicking on icons on the standard toolbar as described in the table.

Table 4.2: Spelling and Grammar Checking

AutoSpellcheck	AutoSpellcheck checks each word as it is typed and displays a wavy red line under any misspelled words. Once the word is corrected, the line disappears.
Spelling and Grammar dialog	To perform a separate spelling check on the document (or a text selection), click the Spelling and Grammar button. This checks the document or selection and opens the Spelling dialog box if any misspelled words are found.

- Dictionary language can be changed on the Spelling and Grammar dialog box.
- By default, a Grammar checker is not available but that can be installed as an extension. Navigate to Tools → Language → More Dictionaries Online
- You can add a word to a dictionary. Click Add in the Spelling and Grammar dialog box and pick the dictionary to add it to.

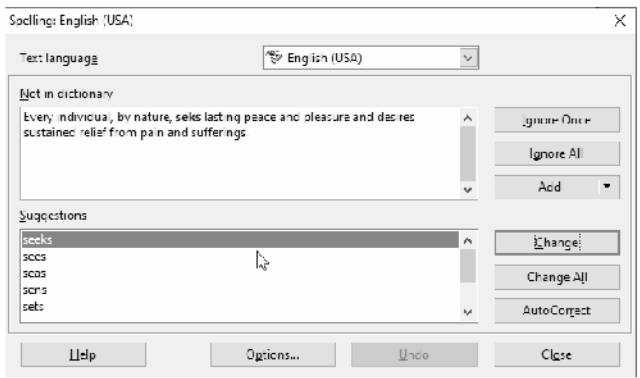


Fig. 4.19: Spelling Checking

4.2.12 AutoCorrect

The writer's AutoCorrect function has a long list of common misspellings and typing errors, which it corrects automatically. For example, "abotu" will be changed to "about". Select Tools → AutoCorrect Options to open the AutoCorrect dialog box (See Fig. 4.9(c)). There you can define what strings of text are corrected and how. To stop the Writer from replacing a specific spelling, go to the Replace tab, highlight the word pair and click Delete. (See Fig. 4.20)

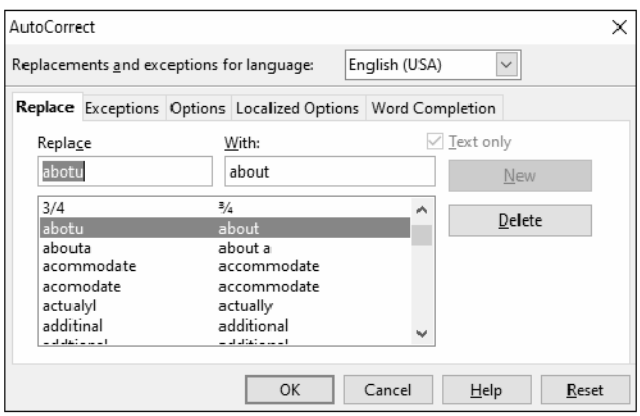


Fig. 4.20: AutoCorrect Options

4.3 OPENOFFICE CALC

Calc is the spreadsheet component of Apache OpenOffice. It contains most of the features found in spreadsheets. Spreadsheets allow us to organize, analyze and store data in tabular form. In spreadsheet we can manipulate this data to produce certain results. Calc is similar to Microsoft Excel and capable of opening and saving various spreadsheet file formats. Other features provided by Calc include:

- Calc consists of several individual sheets, each sheet of cells arranged in rows and columns.
- Functions, which can be used to create formulas to perform complex calculations on data
- Database functions, to arrange, store, and filter data
- Dynamic charts; a wide range of 2D and 3D charts
- Macros, for recording and executing repetitive tasks
- Ability to open, edit, and save Microsoft Excel spreadsheets
- Import and export of spreadsheets in multiple formats, including HTML, CSV, PDF, etc.

4.3.1 Introduction to Spreadsheet, Sheets, and Cells

In Calc, we create files that are called spreadsheets, consists of several separate sheets. Each sheet containing cells arranged in rows and columns. A specific cell is identified by its row number and column letter. Each spreadsheet can have many sheets, and each sheet has a large number of individual cells. In Calc, each sheet can have a maximum of 1,048,576 rows and a maximum of 1024 columns.

4.3.2 Parts of CALC Interface

The CALC interface is depicted in Fig. 4.21. Features of the CALC interface are described below. The menu bar, title bar, formatting toolbar, and standard toolbar have the same functionality as we discussed in the AOO Writer's Interface in section 4.1. A new toolbar i.e., Formula bar is elaborated below.

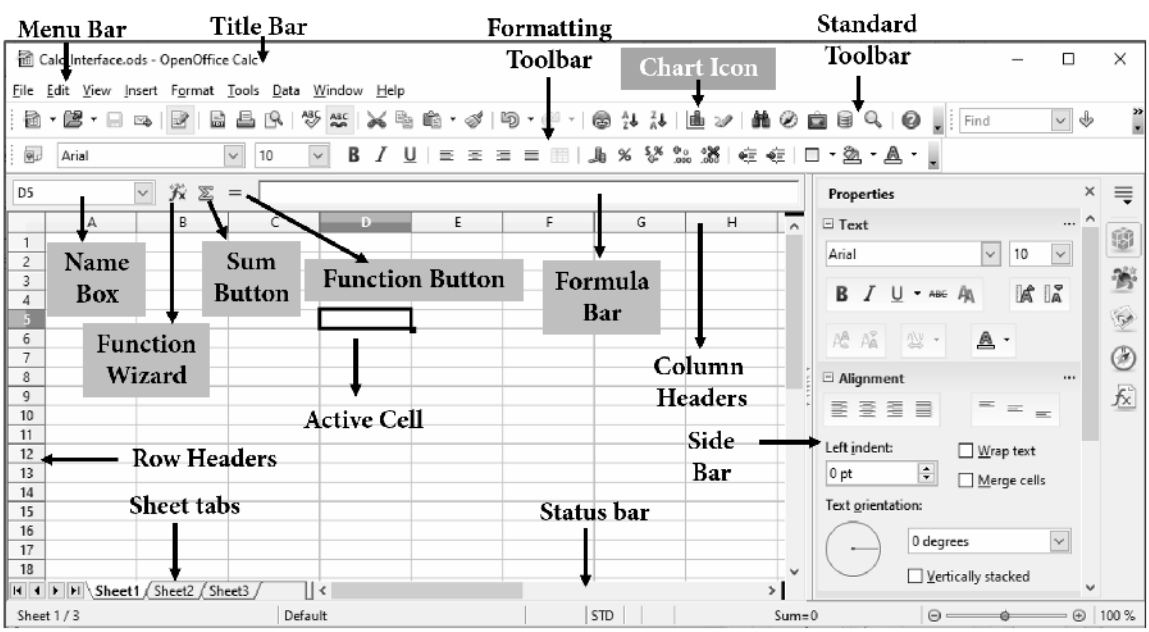


Fig. 4.21: OpenOffice CALC Interface

Formula bar

The formula bar is shown in Fig. 4.21, below the formatting toolbar. It consists of various controls which are annotated with dark background color in Fig. 4.21. The Name box holds the address of the currently selected cell which is D5 in our case. The Function Wizard is used to view or insert available inbuilt functions. It also shows the parameter list and syntax of the functions. Clicking the Sum button inserts a formula into the current cell that totals the numbers in the cells above the current cell. Clicking the Function button inserts an equal (=) sign into the selected cell and the Input line, thereby enabling the cell to accept a formula.

Individual cells

The main section of the screen displays the cells in the form of a grid, with each cell being at the intersection of a column and a row. At the top of the columns and at the left end of the rows are a series of gray boxes containing letters and numbers. These are the column and row headers. The columns start at A and go on to the right, and the rows start at 1 and go down. An active cell is depicted in Fig. 4.21.

Sheet tabs

At the bottom of the grid of cells are the sheet tabs. These tabs enable access to each individual sheet, with the visible (active) sheet having a white tab. Clicking on another sheet tab displays that sheet, and its tab turns white. You can also select multiple sheet tabs at once by holding down the Control key while you click the names. Sheet tabs are shown in the bottom left corner of Fig. 4.21.

4.3.3 Starting, Opening, Saving, and Closing a Document

Starting of CALC document can be Via Operating system Menu, Via QuickStarter, and Via Start Center. The process is already illustrated on pages number 105 & 106. An already created CALC document can be opened Via QuickStarter or Via Start Center as discussed on page 106. Similarly, saving and closing of a document also follow the AOO's standard procedure as we discussed during the Writer component.

4.3.4 Freezing/Unfreezing Rows and Columns

Freezing locks, several rows at the top of a spreadsheet or several columns on the left of a spreadsheet or both. Then when scrolling around within the sheet, any frozen columns and rows remain in view.

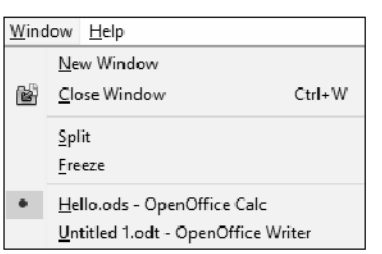


Fig. 4.22: Freezing Rows and Columns

Freezing a row and a column

1. Click into the cell that is immediately below the row you want frozen and immediately to the right of the column you want to be frozen.
2. Choose Window → Freeze. A dark line appears, indicating where the freeze is put.

Unfreezing

To unfreeze rows or columns, choose Window → Freeze. The checkmark by Freeze will be removed.

4.3.5 Creating a Chart

Calc supports a variety of charts and graphs to present numeric data efficiently and conveniently. Using Calc, you can customize charts and graphs to a considerable extent. Many of these options enable you to present your information in the best and clearest manner. To understand it practically we recreate a chart which was presented in unit 1 i.e., percentage share of the browser market (See Fig. 1.3). The step-by-step process will help us for easier understanding.

1. Insert data into the CALC which is to be graphically presented.
2. Select the data to be included in Chart/Graph formation.
3. Either press the Chart icon on standard toolbar (See Fig. 4.21) or Click on Insert → Chart option.
4. It will show a Chart Wizard with the default formation of the chart as per the given data. Chart Wizard is depicted in Fig. 4.23. Now with chart wizard, we can customize our chart.

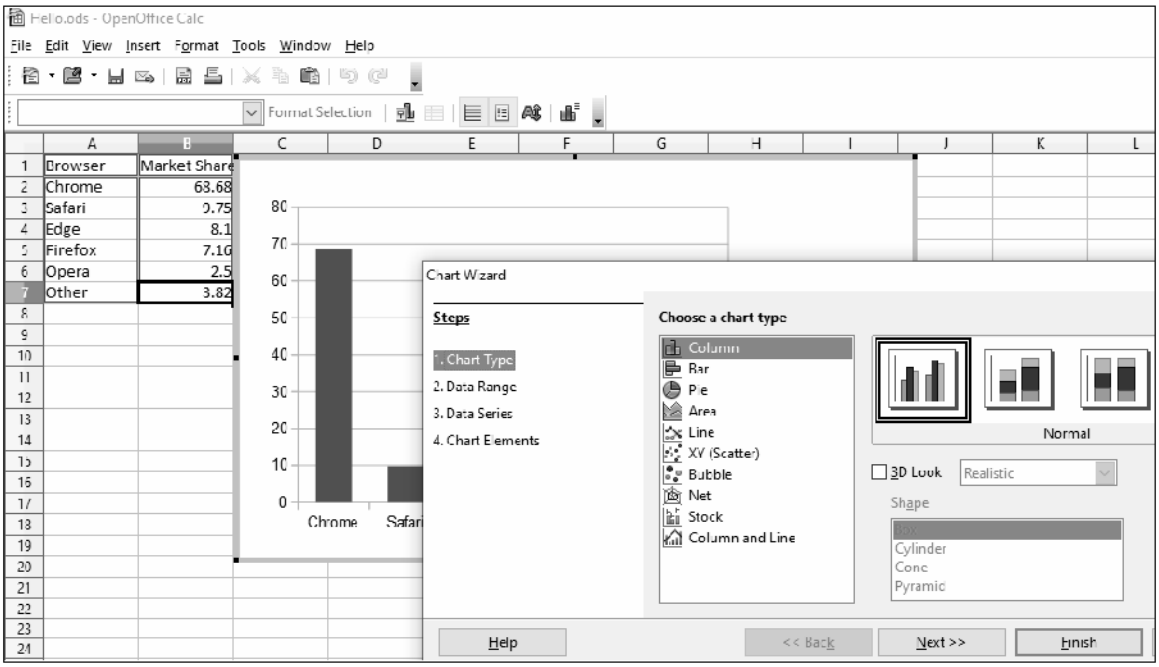


Fig. 4.23: Creating Chart with Chart Wizard

The Chart Wizard has three main parts: a list of steps involved in setting up the chart, a list of chart types, and the options for each chart type. Chart wizard includes four steps to draw a powerful chart.

1. Choosing a chart type: A variety of chart types are provided, we can select any of them by clicking the icon of the chart type. A preview will be shown to us for better selection.
2. Data Range: We can manually reselect the data range (if any error in the previous selection).
3. Data Series: We can fine-tune the data that we want to include in the chart.
4. Chart elements: With the chart elements page, we can give title, subtitle, legends to our chart.

4.3.6 Creating Formulas

In CALC, we can enter formulas in two ways, either directly into the cell itself or at the input line. Either way, we need to start a formula with one of the following symbols: =, + or –. Starting with anything

else causes the formula to be treated as if it were text. Each cell on the worksheet can be used as a data holder or a place for data calculations. Entering data is accomplished simply by typing in the cell and moving to the next cell or pressing Enter. With formulas, the equals sign indicates that the cell will be used for a calculation.

Table 4.3: Common Ways to Enter Formulas in CALC

Formula	Description
=A1+10	Displays the contents of cell A1 plus 10.
=A1*16%	Displays 16% of the contents of A1.
=A1*A2	Displays the result of the multiplication of A1 and A2.
=ROUND(A1;1)	Displays the contents of cell A1 rounded to one decimal place.
=EFFECTIVE(5%;12)	Calculates the effective interest for 5% annual nominal interest with 12 payments a year.
=B8-SUM(B10:B14)	Calculates B8 minus the sum of the cells B10 to B14.
=SUM(B8;SUM(B10:B14))	Calculates the sum of cells B10 to B14 and adds the value to B8.
=SUM(B1:B65536)	Sums all numbers in column B.
=AVERAGE(BloodSugar)	Displays the average of a named range defined under the name BloodSugar.
=IF(C31>140; "HIGH"; "OK")	Displays the results of a conditional analysis of data from two sources. If the contents of C31 is greater than 140, then HIGH is displayed, otherwise OK is displayed.

4.4 OPENOFFICE IMPRESS

Impress is Apache OpenOffice's slide show (presentations) program. Impress creates presentations in the ODP format, which can be opened by other presentation software or can be exported in different presentation formats. We can create slides that contain different elements, including text, bulleted and numbered lists, tables, charts, clip art, and a wide range of graphic objects. Impress also includes a spelling checker, a thesaurus, prepackaged text styles, and attractive background styles.

4.4.1 Creating new Presentation

Firstly, start the impress in one of the following ways:

- If no component of AOO is open, from the Start Center: click on the Presentation icon.
- From the system menu or the AOO Quickstarter.
- From any open component of AOO: click the triangle to the right of the new icon on the main toolbar and select Presentation from the drop-down menu, or choose File → New → Presentation from the menu bar.

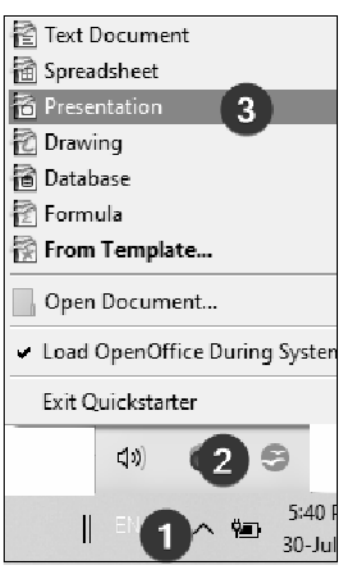


Fig. 4.24: Starting impress from Quickstarter

When you start Impress for the first time, the Presentation Wizard (see Fig. 4.25 & Fig. 4.26) is shown.

1. Under Type, choose one of the options:
   - Empty presentation creates a blank presentation.
   - From template uses a template design already created as the basis for a new presentation. The wizard changes to show a list of available templates. Choose the template you want.
   - Open existing presentation continues work on a previously created presentation. The wizard changes to show a list of existing presentations. Choose the one you want.
2. Click Next. Fig. 4.25(b) shows the Presentation Wizard step 2 as it appears if you selected Empty presentation at step 1. If you selected From template, an example slide is shown in the Preview box.

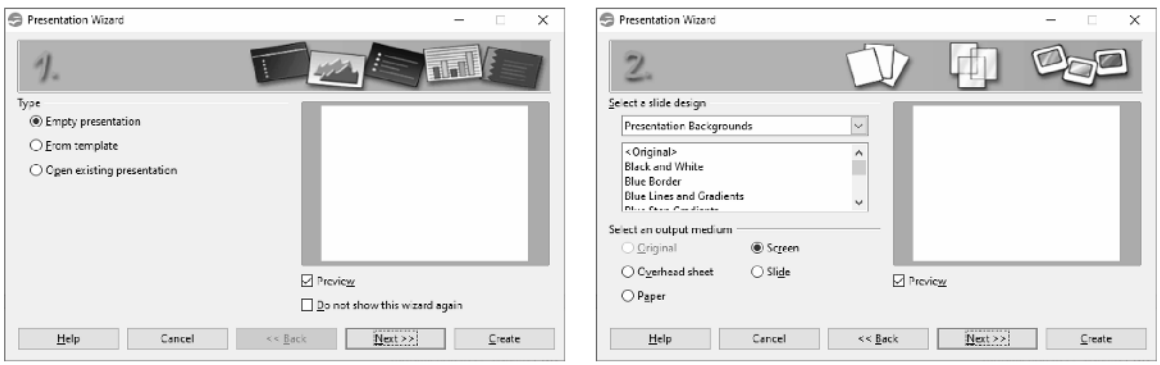


Fig. 4.25: Presentation Wizard (a) Type Selection (b) Design & Output Medium Selection

3. Choose a design under Select a slide design. The slide design section gives you two main choices: Presentation Backgrounds and Presentations. Each one has a list of choices for slide designs. If you want to use one of these other than <Original>, click it to select it.

   The types of Presentation Backgrounds are shown in Fig. 4.25(b). When you click an item, a preview of the slide design appears in the Preview window. <Original> is an empty background. Click an item to see a preview of the slide design in the Preview window.

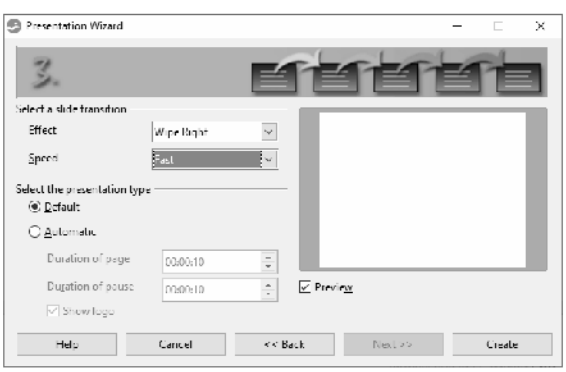


Fig. 4.26: Transition and Presentation Type Selection in Presentation Wizard

4. Select how the presentation will be used under Select an output medium.
5. Click Next. The Presentation Wizard step 3 appears as shown in Fig. 4.26. Select the desired speed for the transition between the different slides in the presentation from the Speed drop-down menu. We have chosen "Fast speed" with "Wipe Right" effect as shown in Fig. 4.26.
6. Click Create. A new presentation is created.

4.4.2 Parts of IMPRESS Interface

The main Impress window (Fig. 4.27) has three parts: the Slides pane, Workspace, and Tasks pane. Additionally, several toolbars can be displayed or hidden during the creation of a presentation.

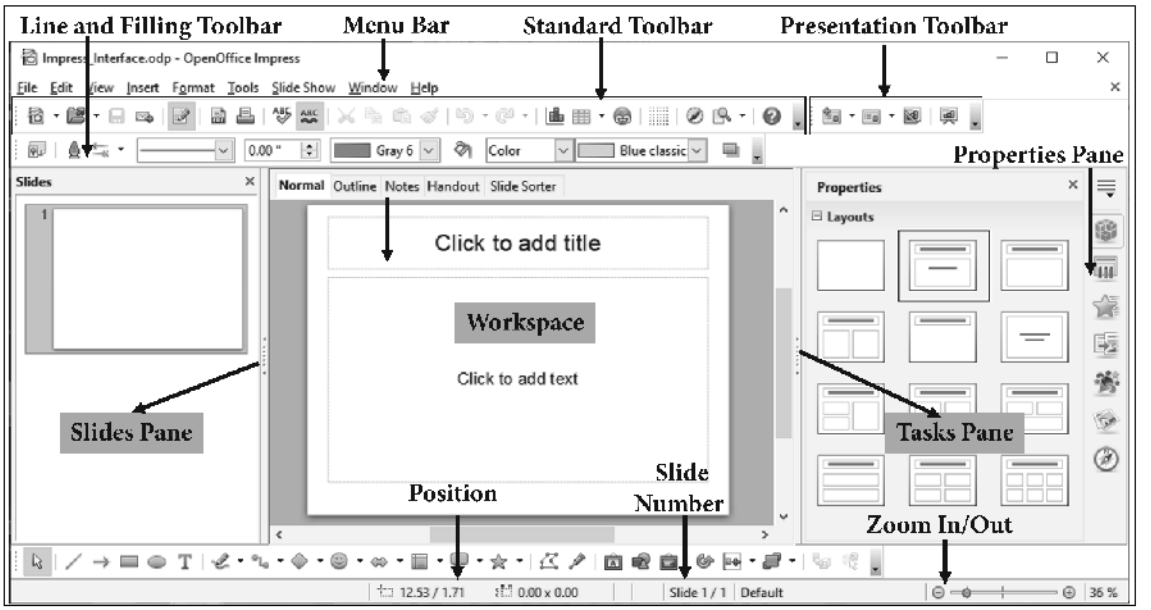


Fig. 4.27: Open Office IMPRESS Interface

Slides Pane

The Slides pane contains thumbnail pictures of the slides in your presentation. Clicking a slide in this pane selects it and places it in the Workspace. When a slide is in the Workspace, you can apply to it any changes desired. Several additional operations can be performed on one or more slides simultaneously in the Slides pane:

- Add new slides to the presentation.
- Mark a slide as hidden, delete a slide from the presentation if it is no longer needed.
- Rename a slide, duplicate a slide or move it to a different position in the presentation.

Tasks Pane

The Tasks pane has several sections. To expand the section you wish to use, click on the right-pointing triangle to the left of the caption as shown in Fig. 4.28. Only one section at a time can be selected.

1. **Master Pages:** Here you define the page style for your presentation.
2. **Layout:** The pre-packaged layouts are shown here. You can choose the one you want, use it as it is, or modify it to your requirements.
3. **Custom Animation:** A variety of animations for selected elements of a slide are listed. Animation can be added to a slide, and it can also be changed or removed later.

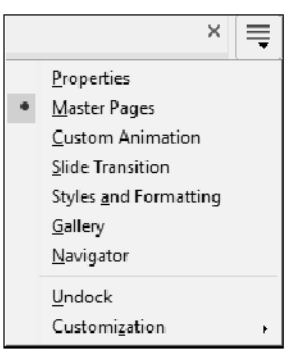


Fig. 4.28: Opening Task Pane Section

4. **Slide Transition:** We can select transition type, its speed (slow, medium, fast), choose between an automatic or manual transition, and choose how long the selected slide will be shown.

Workspace

The Workspace has five tabs: Normal, Outline, Notes, Handout, and Slide Sorter. These five tabs are called View buttons. The Workspace below the View buttons changes depending on the chosen view.

1. **Normal view:** Normal view is the main view for working with individual slides. Use this view to format and design and to add text, graphics, and animation effects.
2. **Outline view:** The outline view contains all the slides of the presentation in their numbered sequence. It shows topic titles, bulleted lists, and numbered lists for each slide in outline format. Only the text contained in the default text boxes in each slide is shown.
3. **Notes view:** Use the Notes view to add notes to a slide.
   a. Click the Notes tab in the Workspace.
   b. Select the slide to which you want to add notes.
   c. In the text box below the slide, click on the words Click to add notes, and begin typing.
4. **Handout view:** The handout view is for setting up the layout of your slide for a printed handout. Click the Handout tab in the workspace, then choose Layouts in the Tasks pane. We can choose to print 1, 2, 3, 4, 6, or 9 slides per page.
5. **Slide Sorter view:** Slide Sorter view contains all of the slide thumbnails. Use this view to work with a group of slides or with only one slide.

Toolbars

Many toolbars can be used during slide creation; they can be displayed or hidden by clicking View → Toolbars and selecting from the menu.

Status bar

The Status bar, located at the bottom of the Impress window, contains information that you may find useful when working on a presentation.

Navigator

The Navigator displays all objects contained in a document. It provides another convenient way to move around a document and find items in it. To display the Navigator, click its icon on the Standard toolbar, choose View → Navigator on the menu bar, or press Ctrl+Shift+F5.

4.4.3 Formatting a Presentation

A new presentation only contains one empty slide. In this section, we will start adding new slides and preparing them for the intended contents.

Inserting slides

Fig. 4.29: Presentation Toolbar

This can be done in a variety of ways:

- Insert → Slide.
- Right-click on the present slide, and select Slide → New Slide from the pop-up menu.
- Click the Slide icon in the Presentation toolbar.

Sometimes, rather than starting from a new slide, you want to duplicate a slide you have already inserted. To do so select the slide you want to duplicate from the Slides pane and then choose Insert → Duplicate Slide.

Selecting a layout

In the Tasks pane, select the Layout drawer to display the available layouts. The Layouts differ in the number of elements a slide will contain, from a blank slide to a slide with six contents boxes and a title. To select or change the layout, place the slide in the work area and select the desired layout from the layout drawer in the Task Pane. Several layouts contain one or more content boxes. (See Fig. 4.30(a)). Each of these boxes can be configured to contain one of the following elements: Text, Media clip, Picture, Chart, or Table. You can choose the type of content by clicking on the icon that is displayed in the middle of the contents box as shown in Fig. 4.30(b). If instead, you intend to use the contents box for text, just click anywhere on the box to get a cursor.

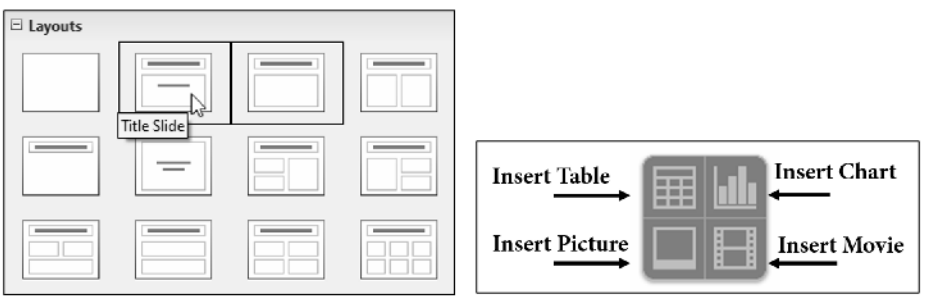


Fig. 4.30: Presentation (a) Slide Layout Options (b) Insert Content Type

Modifying the slide elements

Our slide contains elements as per our chosen layout slide; We may remove unneeded elements and add objects (such as pictures), as well as insert text. To add any pictures or objects to the slide. follow these steps:

1. To add pictures from graphic files to places other than the clipart frame:
   a. Insert → Picture → From File. The Insert Picture dialog box opens.
   b. Browse to the graphic file. To see a preview of the picture, check Preview at the bottom of the Insert picture dialog box. Select a picture and click Open.
   c. Move the picture to its location.
   d. Resize the picture, if necessary.
2. To add text to a slide that contains a text frame, click on Click to add an outline in the text frame and then type your text. The Outline styles are automatically applied to the text as you insert it. You can change the outline level of each paragraph as well as its position within the text by using the arrow buttons on the Text Formatting toolbar
3. To remove any element on the slide that is not required, click the element to select it. The green handles show that it is selected; press the Delete key to remove it.

4.4.4 Applying an Animation Effect

In Normal view, display the desired slide. Select the text or object you want to animate. An object such as a graphic or an entire text box will have green handles around it when selected. In the Tasks pane, choose Custom Animation (see Fig. 4.31). Click Add. The Custom Animation dialog box (Fig. 4.32) appears. Choose an effect from one of the pages of this dialog box, and choose the speed or duration of that effect.

To choose the animation to be applied when the object is placed on the screen, use an effect from the ***Entrance page***, for example, Fly In or Dissolve In. Use the ***Emphasis page*** to apply a basic effect, such as changing the font color, or to add special effects such as blinking text. To choose the effect to be applied when the object is leaving the screen, use the ***Exit page***. If you want the object to move along a line or curve, select an animation from the ***Motion Paths page***.

Click OK to save the effect and return to the Custom Animation page on the Task pane. Here you can choose how to start the animation, change the speed, and apply some additional properties to the selected effect.

Fig. 4.31: Custom Animation

Starting an animation effect

You have three choices for starting an animation effect:

- **On click**—the animation does not start until you click the mouse.
- **With previous**—the animation runs at the same time as the previous animation.
- **After previous**—the animation runs as soon as the previous animation ends.

4.4.5 Running the Slide Show

To run the slide show, do one of the following:

- Click Slide Show → Slide Show on the main menu bar.
- Click the Slide Show button on the Presentation toolbar or the Slide Sorter toolbar.
- Press F5 or F9.

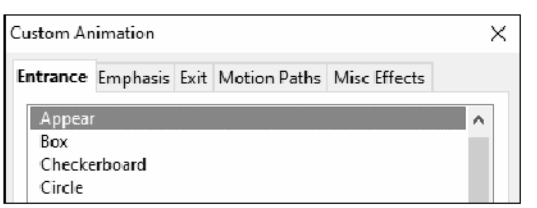


Fig. 4.32: Custom Animation Dialog Box

If the slide transition is Automatically after x seconds, let the slide show run by itself. If the slide transition is On mouse click, do one of the following to move from one slide to the next.

- Use the arrow keys on the keyboard to go to the next slide or to go back to the previous one.
- Click the mouse button to advance to the next slide.
- Press the Spacebar on the keyboard to advance to the next slide.

When you advance past the last slide, the message Click to exit presentation...appears. Click the mouse or press any key to exit the presentation. To exit the slide show at any time including at the end, press the Esc key.

Interesting Facts

- Worldwide over 1700 companies are using OpenOffice.
- Of all the customers that are using OpenOffice, 29% are small (<50 employees), 34% are medium sized and 37% are large (>1000 employees).
- LibreOffice is a forked variant of OpenOffice, the Document Foundation (TDF) uses source code of OpenOffice.org 3.3b in 2010.

4.4.6 Printing a Presentation

Impress provides many options for printing a presentation: with multiple slides on one page, with a single slide per page, with notes, as an outline, with date and time, with page name, and more. For more control over printing a presentation, choose File → Print to display the Print dialog as shown in Fig. 4.33. The ***General tab*** is used to select the printer and its related properties. Range and copies are also given in this tab. What we want to print is selected from the dropdown box under Print option. We may choose slides, Handouts, Notes, or Outline. ***OpenOffice Impress*** tab is used to include slide-specific contents (slide name, date & time, etc.), color, size for the printing. The left pane is showing preview with two slides, it is configured in the ***Page Layout*** tab by pages per sheet set to 2. The options tab can be used for the "print to file" command.

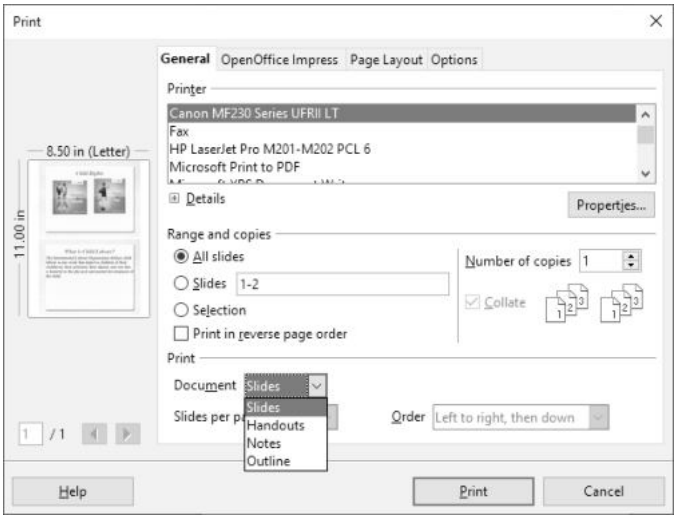


Fig. 4.33: Open Office Impress Print Dialog

VIDEO RESOURCES

TYPE: Video Resources	**Title:** Apache OpenOffice Writer
TYPE: Video Resources	**Title:** Apache OpenOffice CALC
TYPE: Video Resources	**Title:** Apache OpenOffice Impress
TYPE: Video Resources	**Title:** Multilingual Videos on Computer Literacy & AOO

SUMMARY

1. Apache OpenOffice (AOO) is free open-source software that can be downloaded from the official website www.openoffice.org.
2. The writer is a word processor component of AOO. It has extensive support for all common file formats and by default uses the ODF format.
3. OpenOffice Writer views a large document using the Writer preview interface and tools.
4. Calc is the spreadsheet component of AOO for performing numerical and analytical tasks.

5. In CALC we can combine formulas and functions to create a simple spreadsheet application.
6. Impress is used to create a powerful presentation with predefined slide layouts.
7. We can run a slideshow with F9 or F5. Keyboard arrow keys and mouse used for navigation.
8. Workspace view of Impress is used to format the presentation.
9. Workspace's view buttons provide the facility to view slides in various views.
10. Impress can integrate various media types i.e., audio, video, picture, text, charts, etc.
11. Custom animation and transitions provide dynamic look & feel for an impressive presentation.

EXERCISES

A. Objective Questions

Q1. Keys to Moves the current paragraph up.
- A. Ctrl + PgUp
- B. Ctrl+Alt+UpArrow
- C. Alt+PgUP
- D. Alt+Home+UpArrow

Q2. Which among the following file extensions are not compatible with OpenOffice writer?
- A. csv
- B. sxw
- C. doc
- D. txt

Q3. Which of the following is a shortcut key to Redo any operation in the writer ?
- A. Ctrl+R
- B. Ctrl+Y
- C. Ctrl+X
- D. Ctrl+Z

Q4. Apache Openoffice spreadsheet file has an extension of –
- A. .odt
- B. .ods
- C. .odg
- D. .odp

Q5. What kind of Program is OpenOffice Impress?
- A. Spreadsheet
- B. Word processing
- C. Presentation
- D. None of these

Q6. The spreadsheet program of Apache OpenOffice is known as
- A. Draw
- B. Writer
- C. Impress
- D. Calc

Q7. When we select the 'save as' option in CALC which information will ask in the dialog box?
- A. File Name
- B. The location where the file is to be saved
- C. Both (A) & (B)
- D. None of these

Q8. The cell in CALC which is currently selected is known as
- A. Master Cell
- B. Source Cell
- C. Active Cell
- D. Base Cell

Q9. The number of rows in OpenOffice CALC
- A. 1024
- B. 32676
- C. 1056728
- D. 1048576

Q10. Thumbnail pictures of slides are presented by
- A. Workspace
- B. Task pane
- C. Slide pane
- D. None of these

Q11. What is a shortcut command for spelling checking in AOO?
- A. F7
- B. F9
- C. F6
- D. F2

Q12. Which section is available in the Task pane?
A. Master pages
B. Layout
C. Table design
D. All of these

Q13. In AOO Slide can be deleted by
A. Edit → delete slide
B. select the slide and press the delete key
C. Both above
D. None of these

Q14. What is the default formatting command in AOO?
A. Ctrl +B
B. Ctrl + M
C. Ctrl + Q
D. Ctrl + F

Q15. Which menu is used to hide slides in AOO Impress?
A. Format
B. Tools
C. View
D. Slide Show

B. Subjective Questions

Q1. What are the advantages of using OpenOffice software?

Q2. Explain the main parts of the Writer interface.

Q3. Explain the main parts of the CALC interface.

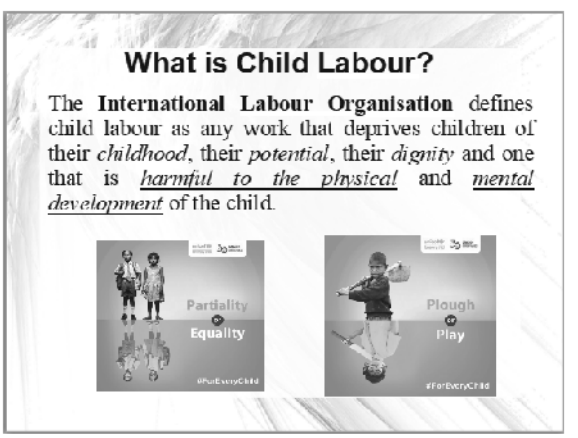
Q4. Explain the main parts of the Impress interface.

Q5. Create a resume in the AOO Writer interface with different logical sections for your personal, academic, and professional details.

Q6. Create a chart as shown in unit one's Fig. 1.3. Data is as under.

Browser	Chrome	Safari	Edge	Firefox	Opera	Other
Market Share %	68.68	9.75	8.1	7.16	2.5	3.82

Q7. Prepare a presentation in AOO Impress to look like below.



ANSWERS

A. Objective Questions

Q.N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Option	B	A	B	B	C	D	C	C	D	C	A	D	C	B	D

B. Hints for Subjective Questions

A1. Explain various advantages of using open-source OpenOffice software i.e., No licensing fees, Open source, Cross-platform, Extensive language support, Consistent user interface, Integration, Granularity, File compatibility, No vendor lock-in, and Community support.

A2. Explain Writer interface's title bar, various menus residing in the menu bar, standard and formatting toolbar, status bar, etc. (Refer Fig. 4.6)

A3. Explain the CALC interface's title bar, menu bar, standard toolbar, formula bar, sheet tabs, status bar, etc. (Refer Fig. 4.21).

A4. In addition to the title bar, standard toolbar, formatting bar also explain Impress interface's various panes i.e., slide pane, workspace pane, tasks pane. (Refer Fig. 4.27)

A5. Create a new Writer document and input your details in logical and chronological order. Use different text formatting options of the standard toolbar and formatting toolbar to present content in an effective way. Use of table and picture is also suggested.

A6. Create a new spreadsheet document in CALC. Input and select the given data. Select Insert → Chart option. A chart wizard window will be shown as in Fig. 4.23. Select appropriate options for chart type, legends, etc.

A7. Create a new presentation as discussed in section 4.3. Then select slide layout "Title and 2 content layout" from the tasks pane. Use the Text tool of the drawing toolbar to insert a text placeholder for definition. Use different slide formatting options for title and content formatting. Insert two pictures of your choice as explained in Fig. 4.30.

KNOW MORE

1. Some functionalities which are not natively available in OpenOffice software are provided by means of various Extensions. These can be downloaded from the below URL: *https://extensions.openoffice.org/*
2. Spelling and Grammar can be checked against multiple languages by installing concerning language dictionaries.

Applications

- The AOO Writer made typing of words and other documents in easier way. It can be used to type almost every kind of content e.g., writing works, official documents or letter typing. It is also used to save our written document, which can serve as record keeping database.
- The AOO CALC is generally used for storing numerical data in tabular form and manipulating it with various predefined formulas. It can be utilized in preparing ledger balance, maintaining accounts, receipt or invoice generation etc.
- The AOO Impress software can design creative and engaging presentation by adding the texts, graphics, video and images. The presentations can be used to showcase company's portfolio or sample in front of a client. Nowadays it is widely used for developing e-Learning resources for educational institutions.

PRACTICALS

Experiment 4.1: Open Office Tools

Practical Statement

Explore features of Open Office tools, create documents using these features, do it multiple times.

Practical Significance

The spread of information technology has ensured the computer has its place in every office. Word processing, mathematical work, and presentation work have an important role in the daily computer tasks of an office. In this practical, we will see the Writer, Impress, Calc component of Apache's OpenOffice Software suite.

Relevant Theory

Various components of Apache Open Office (AOO) Tools like Writer, Impress, Calc have been explained in detail in unit 4. In the unit, we have also learned the description of interfaces of these components and how to create documents in them. Specific functions of each component and process to use them are also learned.

Practical Outcomes (PrO)

The learners will be proficient in working AOO tools and:

PrO1: creating a general office proforma in the Writer component of AOO.

PrO2: creating a receipt proforma in the CALC component of AOO.

PrO3: creating a presentation in the Impress component of AOO.

Practical Setup (Work Situation)

In this practical, students should be provided with the different scenarios to work on and let them choose the AOO component of their choice.

Scenario 1: Suppose you are working in the education department and assigned to create a proforma to collect the teacher's profile. Fields for data collection with a sample proforma are provided as in Fig. 4.34.

Scenario 2: Considering yourself as an employee of a service provider company, prepare the receipt proforma given to you. Calculations should be done automatically in the electronic version (softcopy) of the proforma. The sample receipt, given to your customer should be as depicted in Fig. 4.35.

Scenario 3: Assuming yourself a government official, prepare an informative presentation on the Start-up India campaign. The sample template is depicted in Fig. 4.36.

Resources Required

1. A computer system i.e., PC/Laptop.
2. Installed Apache OpenOffice software.

TEACHER'S PROFILE

YEAR: .....

Employee's code	:	U-DISE Code No.	:
Name of the teacher	:	State/UT	:
Date of birth	:	District	:
Designation	:	Block	:
School's address	:		

Academic/Professional Qualifications:

Academic Qualifications:			
Examination	**University/ Board**	**Year**	**Subjects**
Graduation			
Post-Graduation			
Ph.D.			
Professional Qualifications:			
D.Ed./D.El.Ed./Eq.			
B.Ed./Equivalent			
M.Ed.			

Experience:

Experience	Period		Total	
	From	To	Year	Months
Teaching				
Administrative				
Other				

Achievements/Awards (if any):

1. _____

2. _____

Signature of Teacher

Fig. 4.34: A Template Proforma for Teacher's Profile

Precautions

1. Back up and save your working document periodically to protect it from data loss.
2. Analyze page size, page layout, slide layout as per proforma/slide being created.

Shyam Techno Services **RECEIPT**

[Street Address]
[City, ST ZIP]
Phone: 8001234567

INVOICE #	DATE
20215	10-08-21

BILL TO	CUSTOMER ID	TERMS
[Name] [Company Name] [Street Address] [City, ST ZIP] [Phone] [Email Address]	564	Due Upon Receipt

DESCRIPTION	QTY	UNIT PRICE	AMOUNT
Service Fee	1	200.00	200.00
Labor: 5 hours at 200 ₹ /hr	5	200.00	1,000.00
Parts	1	1,750.00	1,750.00

Thank you for your business!	SUBTOTAL		2,950.00
	GST		18.000%
	TAX		531.00
	TOTAL	INR	3,481.00

If you have any questions about this invoice, please contact
[Name, Phone, email@address.com]

Fig. 4.35: A Template Proforma for Receipt

Suggested Procedure

(a) Proforma for Teacher's Profile

The sample proforma depicted in Fig. 4.34 should be created in Writer program for quick formatting and provided layout, although it can be created in other components as well.

1. Open a new Writer document (refer to unit 4, section 4.1)

2. Go to the format → page → page tab, choose paper size, margins, etc.
3. Type the top 7 rows and format the rows to look like in the given proforma, using the basic formatting command available in the formatting toolbar.
4. Create a table having 4 columns and 9 rows to accommodate content provided in proforma for academic/ professional qualification. To do go to Insert → Table or press Ctrl+F12.
5. Merge columns of row 1 and row 6 by selecting their cell → right-click → Cells → Merge. Adjust the size of columns by dragging the borders.
6. Apply text formatting commands like center, background color, font size, and type as specified in the given proforma.
7. Create another table for Experience details via the following steps similar to steps 4 to 6.
8. Create a numbered list for collecting experience details. Type underscore three times and then press Enter to insert a line as given in proforma.

(b) Proforma for Receipt

The sample proforma depicted in Fig. 4.35 should be created in CALC program for quick formatting, layout, and calculation needs. There may be different ways to prepare such document. One sequence of steps is mentioned below.

1. Open a new CALC document.
2. Go to the format → page → page tab, choose paper size, margins, etc.
3. As depicted, content has a maximum of 4 columns of data so all text layout can be adjusted in 4 columns.
4. Merge first 3 cells of row 1 and type name of the company i.e., Shyam Techno Services. Merging can be done via the Merge cells command provided on the Formatting toolbar.
5. Insert and merge other content as per the given layout.
6. Apply various text formatting commands e.g., Font type, size, background color, alignment of text to make our document identical to the given proforma (as much as possible). You may use "Format Paintbrush" for quicker formatting.
7. To present numbers with decimal fractions: Right-click on cell → Format Cells → Number → Options, set decimal places to 2.
8. Apply formulas for calculating Amount, Subtotal, Tax & Total. (refer to unit 4, Table 4.3)

(c) Presentation on Start-up India campaign

By looking at both the slide we have to develop the slide. First Slide is having one image (right upper corner) and 5 text sections with different formatting, numbering styles. Slide 2 is having six text segments for infographics and one for the heading of the slide. The slide is also having some numbering on the left upper corner of text segments. We may follow the below steps to create our presentation to look like the given template.

1. Open a new Impress presentation with Presentation Wizard (refer to unit 4, section 4.3)
2. Select blank layout from Tasks pane.
3. Insert Text with Text icon from text toolbar or drawing toolbar or by pressing the F2 key.
4. Similarly, insert other text segments and input desired data on them. Apply formatting options like background color, font size, font color, font style, numbering.
5. Find the Start-up India logo on a search engine, insert and place it on right upper corner.
6. Insert a new slide by right click on the Slides pane and then click New Slide.

7. Insert a text segment for heading and apply formatting options as given in the template.
8. Insert another text segment and type the text for the first information. Apply text formatting.
9. Select the text box and fill it with color by Properties pane → Area → Fill drop down to color and choose the desired color.
10. To insert numbering with a circle; create a circle with help of an ellipse icon. Double click to insert the numbering value. Fill it with the desired color as in the previous step.
11. Select text box and circle shape and recreate another text segment with numbering by copying & pasting. Make desired changes as per the second information box of the slide.
12. place the segments by drag and drop or by keyboard navigational keys.
13. Repeat step 11, for the next four text segments and numbering.

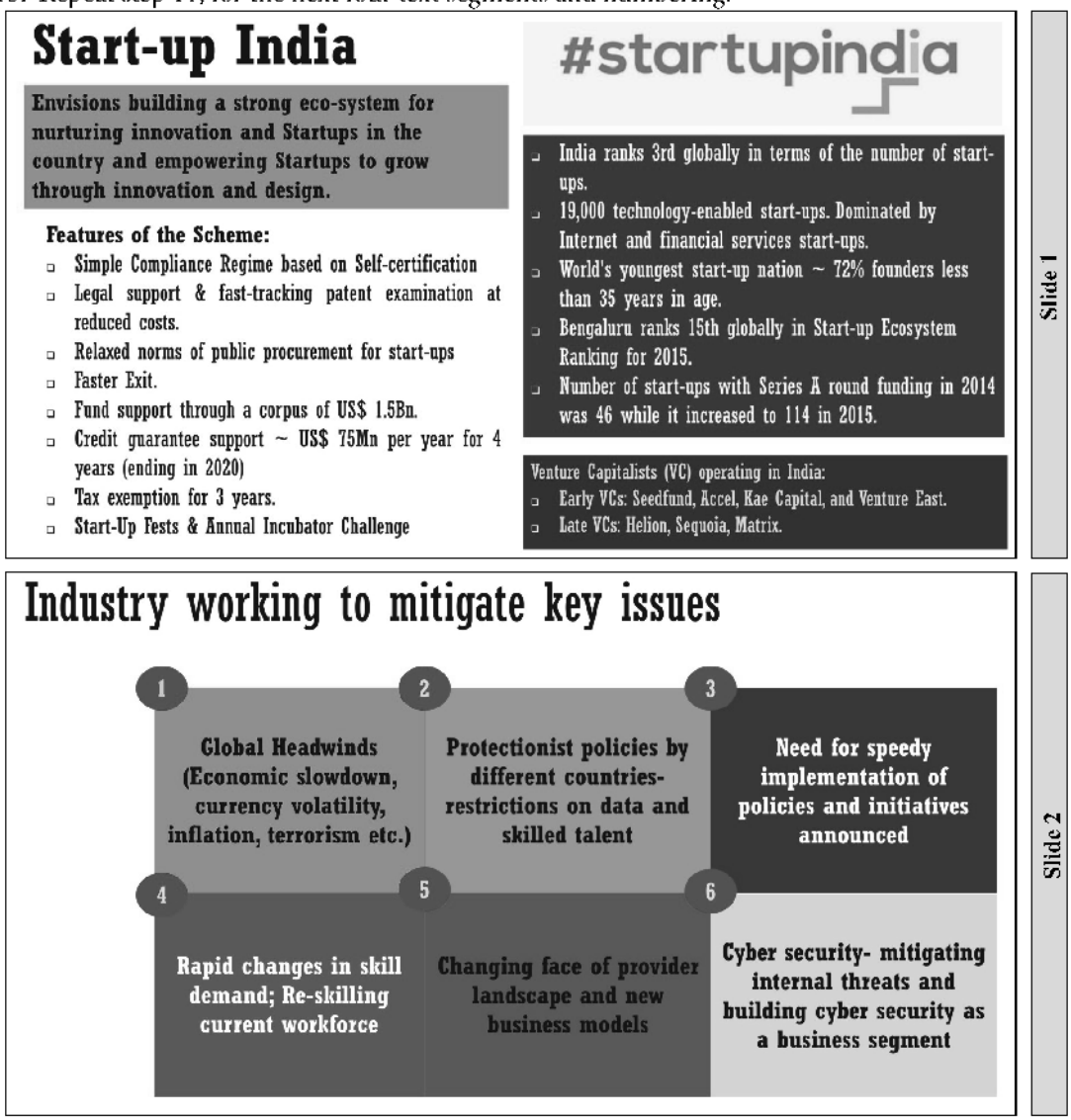


Fig. 4.36: A Template- Presentation Slides

Practical Related Questions

1. Which text formatting commands have you used to create the teacher proforma?
2. How do you set the spacing between two lines to "double"?
3. What would you change in the receipt proforma to give a discount? and how?
4. How to change the background and layout of the entire slide?

Suggested Learning Resources

- Enriched online help and documentation files developed by OpenOffice.org.

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment regarding process and product related marks.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Explanation of practical components i.e., section 1.2 to 1.7	15	
2.	Procedure adoption and step-by-step explanation	15	
3.	Viva voce	25	
Process Related: ..... Marks* (.....%)			
4.	Preparation of Writer document with proper text formatting, coloring and alignment of text boxes, tables.	15	
5.	Preparation of CALC document with proper formatting, alignment of text boxes, and formula creation.	15	
6.	Preparation of Impress document with proper text formatting, alignment of text boxes, images, etc.	15	
	Total	**100%**	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... **Marks Awarded**			**Signature of Teacher with date**
Process Related	Product Related	Total	

REFERENCES AND SUGGESTED READINGS

Enriched online help and documentation files developed by OpenOffice.org:

[1] "Getting Started with OpenOffice.org 3.3." Accessed: Aug. 10, 2021. [Online]. Available: https://wiki.openoffice.org/w/images/3/32/0100GS33-GettingStartedOOo33.pdf.

[2] "OpenOffice.org 3.3 Writer Guide Word Processing with OpenOffice.org 3.3." Accessed: Aug. 10, 2021. [Online]. Available: https://wiki.openoffice.org/w/images/1/11/0200WG33-WriterGuideOOo.pdf.

[3] "OpenOffice.org 3.3 Calc Guide Using Spreadsheets in OpenOffice.org 3.3." Accessed: Aug. 10, 2021. [Online]. Available: https://wiki.openoffice.org/w/images/d/d4/0300CS33-CalcGuide.pdf.

[4] "Impress Guide Presentations in OpenOffice.org." Accessed: Aug. 10 2021. [Online]. Available: https://wiki.openoffice.org/w/images/f/f1/0500IG33-OOoImpress3.pdf.

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5 Information Security Best Practices

UNIT SPECIFICS

This unit specifies fundamentals of information security, various threats to it and ways to combat against security attacks to protect the information. Unit gives best practices for software and hardware environments for handling security threats. Learners will be able to understand the best way of protecting their digital information. Security is needed at all layers through which information passes or it is stored. In this unit rulesets which is referred as best practices are defined for general computer usage, internet browsing, password management, email communication, USB device usage, Home Wi-Fi Network, social engineering threats, instant messaging, online transaction and public computer.

RATIONALE

Information Technology (IT) is a man-made world that is mostly digital at present. The digital world is limitless having no physical or geographical boundaries. In unit one we studied applications of the internet and the recent efforts by the government of India to empower its citizen with IT services. The Digital India program has taken great efforts to make India a digitally empowered nation by the development of digital infrastructure, services, and capacity building of citizens.

People's involvement in IT has increased a lot with various national and state portals. Affordable mobile and communication technology has given unprecedented momentum to IT. Whether it is a public place, our office, home, the bedroom we are surrounded by IT. Our daily lives are being penetrated by IT and it is worthwhile to say that beyond being surrounded with it, nowadays we wear it, and even further it is inside us in the form of pacemakers. Insecure practices and abundant use of CCTVs, mobile systems, and other digital equipment may keep us under surveillance. In this digital era, our privacy and information are at the stake and we are living under information security threats. Incidents of information security breaches can be easily observed in daily newspapers. We can verify the rapid increase in such cases with reports from National Crime Records Bureau (NCRB). The rapid increase in cases of cybercrimes shows the lack of information security awareness and its practices.

Information security is of utmost concern not only at the national level but internationally. Nowadays, information security is not only about economic, reputation, or personal security, it is synonymously used for national security. Government IT offices, service providers, many software and hardware engineers are continuously working as gatekeepers to make this digital world safer. IT system should be secured at the individual level, office or company level, service provider level and role of national agencies are of utmost importance. Privacy and information security at the personal level are dependent on the safety of the overall IT system and vice versa. Therefore, it is significant here to understand information security practices to make the overall IT system secure.

PRE-REQUISITES

- Fundamental knowledge of using computer systems, browsing on the internet.
- Basic knowledge of common operating system features.
- Skill to install new application software and troubleshoot basic hardware issues.

UNIT OUTCOMES

Learners will be able to:

U5-O1: Define various information security threats.
U5-O2: Implement the best practices of using software environment e.g., browser, email client, etc.
U5-O3: Implement the best practices of using digital devices e.g., PCs, modems, USB disks, etc.
U5-O4: Protect themselves from basic information security threats & safeguard their online accounts.

Table 5.1: Mapping of Unit Outcomes with the Course Outcomes

Unit-5 Outcome	EXPECTED MAPPING WITH COURSE OUTCOMES *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*						
	CO-1	CO-2	CO-3	CO-4	CO-5	CO-6	CO-7
U5-O1	2	2	1	2	2	1	3
U5-O2	2	1	2	2	2	2	3
U5-O3	1	3	2	1	1	1	3
U5-O4	2	2	2	1	1	2	3

5.1 INTRODUCTION TO INFORMATION SECURITY

5.1.1 What is information?

Information is referred to as the act of informing. When any kind of meaningful data is processed in a meaningful form, it is termed information. An example of personally identifiable information is depicted in Fig. 5.1. Different kinds of data, face photo, name, address, Aadhar details, bank details, mobile no., email address, location, biometric details, some government sector secret data, etc. are processed in a combined form and it becomes information of particular person or organization. IT Act 2000 defines Information in a more precise way as "It includes data, text, images, audio, codes, computer programs, software video, etc."

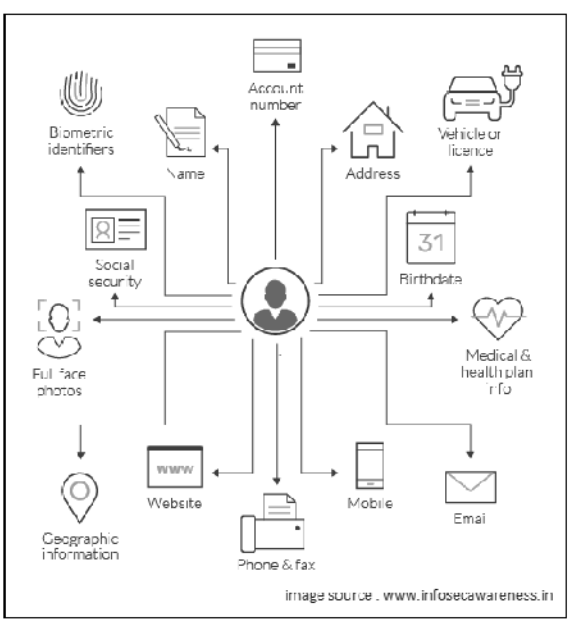


Fig. 5.1: Information- an Example

5.1.2 What is Information Security?

Information Security is defined as the processes and methodologies to protect the print, electronic,

or any other form of confidential, private, and sensitive information or data from unauthorized access, use, misuse, disclosure, destruction, modification, or disruption. It is also termed InfoSec in short.

5.1.3 What are Information Security Goals?

There are three main goals protected by information security, collectively known as CIA triads, depicted in Fig. 5.2.

Confidentiality: This feature indicates that authorized users should be allowed to access data or computer systems, it prevents unauthorized users from the disclosure of data hence protect the privacy of information. Confidentiality is maintained through access control mechanisms. Breaches of confidentiality can occur due to human error, physical theft, system glitches, intentional sharing, skimming, etc.

Integrity: In the InfoSec integrity principle explain data should not be modified without authorization. It ensures the authenticity and accuracy of information. Integrity is achieved by imposing restrictions to modify the data. Users having permission to edit can only make changes.

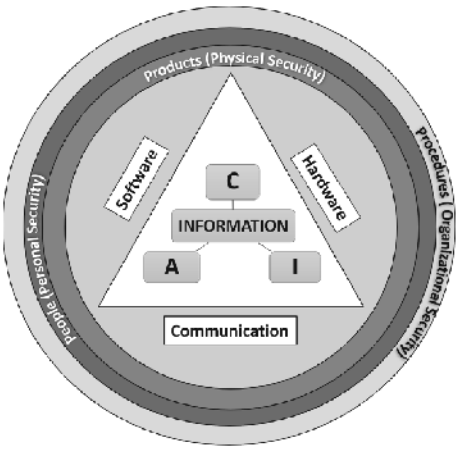


Fig. 5.2: Information Security Attributes (Confidentiality, Integrity, Availability TRIADs)

Availability: It ensures that information should be available, whenever required. A legitimate user reliably accesses demanded information with this attribute of information. For an ideal information system, it should avoid any kind of service disruption like power failure, hardware failure, etc. Continuity of access procedures, scheduled backups, regular maintenance is useful to achieve this attribute.

In addition to the above three key principles of InfoSec, there are two more, authenticity and non-repudiation. **Authenticity** ensures that only legitimate users can have access to the system resources. It is done via confirming their identities before granting any system resources to them. User name, password, email, biometrics, etc. is used to achieve authenticity. **Non-repudiation** principle ensures that the sender of data is provided with proof of delivery and the recipient is provided with proof of the sender's identity, so neither party can deny sending, receiving, or accessing the data. Security principles should be used to prove identities and to validate the communication process.

5.2 THREATS TO INFORMATION SECURITY

In this section, we will learn in brief common information security attacks and vulnerabilities.

5.2.1 Malware

These are the software created to fulfill malicious intentions. Some malware is as under:

Ransomware: It prevents the user to access their operating system, or certain applications, or any data by encrypting their data. Hackers demand money from victims to decrypt their files. The motive behind ransomware attacks is monetary. CryptoLocker, Conti, WannaCry are some examples of ransomware.

Trojan: It is a malware that appears to have normal functionality but in reality, its malicious activity creates backdoors entry into the target computer. Flame, Banker, Downloader, Zeus, and Beast are an example of some popular trojans.

Worm: It is a vulnerable computer attack tool for the system. It works on the law of exponential growth thus it infects many more computers in a very short period. ILOVEYOU, Code Red, Explorer.zip, Love Bug, W32.Nimda, and W32.Stuxnet is an example of some popular worms.

Spyware: A malware that spy the user's information with the aim to harm them e.g., cookies on webpages and keyloggers can log everything including your credentials.

Adware: It is malware that is designed to create revenue for its developers. It is also termed advertising-supported software. It tracks user's behavior and sells out that information to interested third parties. To avoid adware, use an adblocker.

Keyloggers: A spyware that is designed for stealing the data via recording the keystrokes pressed by the user on their keyboard. An attacker may track your typing in a real-time manner or afterward via a file used to store the keystrokes. ComputerSpy, Kidlogger, syprix are some examples of keyloggers.

Virus: It is a computer program that replicates and attaches itself to another legitimate computer program to infect the computer system. Viruses disrupt the working of CPU, personal files, computer systems, etc. MyDoom, ILOVEYOU, Slammer, Stuxnet are some scariest viruses.

Sweepers: These are programs to wipe out data from the targeted machines.

Backdoor: If malicious users gain access to the system, they can install a program, used to create another way (backdoor) to enter into the system. The purpose is to gain unauthorized access to the system. Deep Throat, Portal of Doom, Subseven, NetBus are some popular backdoors.

5.2.2 Social Engineering Attacks

The people can be tricked or psychologically manipulated with help of technology to take some actions or divulge confidential information. Some popular attack is as under:

Phishing: It is one of the common types of social engineering scams. The hacker typically sends an email or text to the target, seeking information that might help with a more significant crime. For example, a hacker might send emails that appear to come from a source trusted by the victim. That source might be a bank, for instance, asking email recipients to click on a link to log in to their accounts. Those who click on the link, though, are taken to a fake website that, like the email, appears to be legitimate. If they log in at that fake site, they are essentially handing over their login credentials and giving the crook access to their bank accounts

Vishing: It is the voice version of phishing. "V" stands for voice, but otherwise, the scam attempt is the same. The hacker uses the phone to trick a victim into handing over valuable information. For example, a hacker might call an officer, posing as a government officer. The hacker might prevail upon the victim to provide login credentials or other information that could be used to target the Organization.

Smishing: It is the text version of phishing which is an acronym for SMS phishing.

Baiting: In such a scam a USB drive or other electronic media is preloaded with malware and supplied to users. When a user plugs this device into their system, malware will enable hackers to hack your computer.

Quid pro quo scam: It is another type of social engineering attack that involves an exchange as I give you this, and you give me that. Hackers make the victim believe as a fair exchange, but that's far from the case, as the cheat always comes out on top.

For example, a hacker may call a target, pretending to be an IT support technician. The victim might hand over the login credentials to their computer, thinking they are receiving technical support in return. Instead, the hacker can now take control of the victim's computer, loading it with malware or, perhaps, stealing personal information from the computer to commit identity theft.

5.2.3 Network Threats

Sniffers: Sniffers are programs to monitor network traffic via tracing network packets. These can be used to gather important information which will be helpful in the attack. Windump, tcpdum, wireshark are some examples of sniffers.

Botnet: A infected device is termed as the compromised device. When a group of such compromised devices (zombies) are under the control of some malicious user then the user can use this network of zombies to attack other systems. Such a zombie network is termed a botnet.

Pharming: Pharming is a process of illegal installation of malware on a computer or a network.

Man-in-the-middle (MitM) attack: Such an attack happens due to insecure communication. In such a cyberattack an attacker relay or possibly alter the ongoing communication between sender and receiver without their knowledge. An attacker can intercept requests and responses and hence become able to read the contents between the sender and receiver. There are various types of MitM attacks as under:

IP spoofing: IP spoofing is the creation of Internet Protocol (IP) packets that have a modified source address to either hide the identity of the sender, impersonate another computer system or both. It is a technique often used by bad actors to invoke DDoS attacks against a target device or the surrounding infrastructure.

Session hijacking: A session between the user and the server can be hijacked by the attacker. Some of the methods used in this regard are session fixing and session prediction. Here, usually, a valid session between the user and server is taken over by the attacker.

Distributed denial of service (DDoS): DDoS attacks occur when attackers overload servers or resources with requests. Attackers can perform these attacks manually or through botnets, networks of compromised devices used to distribute request sources. The purpose of a DDoS attack is to prevent users from accessing services or to distract security teams while other attacks occur.

5.3 COMBATING INFORMATION SECURITY THREATS

We will learn various information security technologies to protect our information from fraudulent users. It is considered that security is an art, not science. It is a continuous process. In case of a security breach, an incident reporting process should be followed to safeguard others.

5.3.1 Firewall

A firewall is a dedicated device, or a computer, that monitors network traffic passing through it and allows routes to be rejected or approved based on rules. It is software or hardware that is usually placed between a secure network and an unsecured network, and it acts as a gateway that ensures that nothing private and malicious things can go out. is not coming in.

Based on protection intension & their location in the network firewalls are classified into the host and network firewalls. A firewall can be an excellent way to stop a denial of service (Dos) attack. It can be used to prevent a hacker from scanning the internal details of your network. The firewall is not a panacea for security as it cannot block every attack. The firewall also won't stop you from downloading a Trojan horse. It also cannot stop internal attacks.

5.3.2 Data Backup

Data backup is the process of creating copies or duplicating the data. Data backup strategy is very common and useful in case of loss, deletion, or corruption of our data. It restores us work till last taken

backup. Data backup keeps us capable of maintaining the integrity and availability goal of information security. Backup can be taken in three ways: incremental backup, differential backup, and full back up.

5.3.3 Virtual Private Network (VPN)

The virtual private network is a network that is constructed by using public wires (usually the Internet) to connect to a private network, such as a company's internal network. Many systems enable the creation of networks using the Internet as the medium for transporting data. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

5.3.4 Encryption

Plain data can be converted into a nonreadable format by applying some techniques. Encryption is such technique that disguises plain text to hide the actual data for the sake of achieving security. Cryptographic encryption techniques are used to protect the data and enforce confidentiality during its transmission and storage.

5.3.5 Anti-Virus Software

Anti-virus software not only protects & clean user from malware infection but it provides safety from several other attacks and keeps our information safe. Effective Anti-Virus Software is expected to provide the following features:

- Anti-Virus Features
- Anti-Trojan Features
- Anti-Spyware Features
- Scan even compressed files
- Automatically detect USB
- Quarantine infected files
- Instant Messaging Protection
- Anti-Worm Features
- Anti-Rootkit Features
- Anti-Phishing Features
- Scan e-mails
- Automatically clean infected files
- Registry Protection

Some popular anti-virus software are Symantec Norton Anti-Virus, MacAfee Anti-Virus, Kaspersky Anti-Virus, Bitdefender Anti-Virus Plus, Avg Anti-Virus, Quick Heal, etc.

5.3.6 Intrusion Detection System (IDS)

IDS contains various tools for real-time monitoring of inbound and outbound traffic in suspect of threats. IDS system alerts the user in case of any fraudulent traffic approaches to our system.

5.3.7 Intrusion Prevention System (IPS)

IPS security solutions are advanced systems, these not only detect the fraudulent traffic source but prevent our system from their attack by blocking requests or ending user sessions. Mostly IDS and IPS are often used together. In IPS various rules and policies are created for incoming and outgoing packets. Policies check the packet information and depending on the traffic rule action to allow or deny is issued.

5.4 INFORMATION SECURITY BEST PRACTICES

As we studied there are many threats to InfoSec and it's need of the hour to safeguard ourselves and in turn society from such vulnerabilities. We have to keep ourselves aware and updated about InfoSec safety

tools and techniques. Technology should be our assistant (or slave) not our master, hence we must adhere to some good habits to use technology in an effective way.

Ministry of Home Affairs (MHA), Government of India has issued InfoSec guidelines for the benefit of Government officials/officers. The guidelines are more or less applicable to every individual. Official persons also come through the education system, so future officials (today's students) must learn these best practices of InfoSec. The enlisted information security best practices will provide us a basic checklist for our day-to-day digital life, to maintain security hygiene. These are presented in form of logical lists where each list addresses some common InfoSec issues. Readers must adhere to these InfoSec best practices and contribute to keeping India digitally safe.

5.4.1 General Computer Usage

Following is some of the best practices for computer use on day-to-day basis:

1. All classified work should be strictly carried out only on a standalone computer that is not connected to the internet.
2. Create strong passwords for login by using a combination of letters, numbers, and special characters with a minimum of 10 characters.
3. Computers should be protected from viruses/worms using Antivirus software permitted for use by your organization.
4. Make sure your operating system, application, and software patches including anti-virus software are up to date; and auto-updates are turned on in your computer.
5. Don't leave the computer unattended with sensitive information on the screen.
6. Always lock your computer before leaving workplace to prevent unauthorized access. A user can lock computer by pressing "ctrl +alt+del" and choosing "lock this computer" or "Window Key+ L".
7. Enable a password-protected screen saver with a timeout period of 2 minutes to ensure that computers that were left unsecured will be protected.
8. Be careful of what you plug into your computer. Malware can spread through infected USB drives, external hard drives, and even smartphones.
9. Use non-administrator account privileges for login to the computer and avoid accessing with administrator privileges for day-to-day usage.
10. Treat sensitive data very carefully and use encryption to securely encode sensitive information.
11. Back up your important files at regular intervals to avoid unexpected loss.
12. Remove unnecessary programs or services which are not required for day-to-day operation.
13. Do not give remote access, file, and print sharing option to other computers.
14. Do not use file-sharing software as file-sharing opens your computer to the risk of malicious files and attacks.
15. Avoid entering sensitive information onto a public computer like cybercafe, library computers, etc.
16. If you store or download any personal information on computers in a cybercafe, make sure you delete permanently all the documents after you are done with your work. You may press the Shift and Delete buttons together to make it difficult to recover deleted files.
17. Remove files or data you no longer need to prevent unauthorized access to such data. Merely deleting sensitive material is not sufficient, as it does not remove the data from your system. File shredder software should be used to delete sensitive files on computers.

18. Ensure to use an uninterrupted power supply to computers through UPS or other backup sources.
19. Do not plug the computer directly into the wall outlet as power surges may damage the computer. Instead, use a genuine surge protector to plug a computer.
20. The systems should be placed in a room that is dust-free and has good ventilation to avoid overheating of the CPU.
21. Supervise maintenance or rectification of faults in the system by service engineers.
22. Don't eat food or drink near the PC.

5.4.2 General Internet Browsing

Following is some of the best practices to keep in mind when browsing on the Internet:

1. Always be careful when clicking on links or downloading. If it's unexpected or suspicious for any reason, don't click on it.
2. Do not download any type of files/software from any source other than those allowed by your system administrator/department.
3. Use a web browser that has been permitted by your organization.
4. Always use an updated web browser for browsing. An old version browser may contain security vulnerabilities and you risk having your computer compromised. Depending on the security exploit, your personal information (including emails, banking details, online transactions, photos, and other sensitive information) could be stolen or destroyed.
5. Do not store/ share any sensitive information on any device that is connected to the Internet.
6. The "Save password" option prompted by the browser should not be selected. Don't save account information, such as passwords or credit card information in web browsers.
7. Look for the "https" sign with a green padlock icon in the browser address bar to verify that site is secure. The "s" in "https" stands for secure, meaning that the website is employing SSL encryption.
8. Enable multi-factor authentication (MFA) to all possible online accounts and services. It is used to verify your identity via a separate channel.
9. Make a habit of clearing history from the browser after each logout session.
10. No classified information of government can be stored on private cloud services (Google Drive, Dropbox, iCloud, etc.,) and doing so may make you liable for penal action, in case of data leakage.
11. When on tour, avoid using services that require location information, unless it is necessary for the discharge of official duties.
12. While browsing, some pop-ups may appear with the option of a close button. These may be fake and may try to install spyware when you click. Beware of such pop-ups and avoid clicking on them.
13. Popup blocker option should be kept turned ON in the browser and may be selectively allowed for trusted sites if required. Doing so will help prevents any nuisance web ads or malware embedded in ads from appearing on screen.
14. Remember that things on the internet are rarely free. "Free" Screensavers etc., often contain malware. So be aware of such online free offers.

15. Avoid using public computers and public Wi-Fi connections to access and carry out any financial or sensitive transactions.
16. If your job requires you to access certain information systems in a secure way, it is advisable to use security controls such as MPLS link, VPN over the internet, etc., for such access.

Activity 1

Make a list of tasks you usually perform on computer and internet. Now, prepare a list of vest security practices for yourself. Share this list with your friends and compare it to their lists.

5.4.3 Password Management

Unauthorized access is a major problem for anyone who uses a computer or devices such as smartphones or tablets. The consequences for victims of these break-ins can include the loss of valuable data such as classified information, personal data, etc. One of the most common ways that hackers break into computers is by guessing passwords. Simple and commonly used passwords enable intruders to easily gain access and control a computing device. Following is some of the best practices to consider while setting up and managing a password,

1. Create a strong password with a minimum length of ideally 10 characters and comprising of a mix of alphabets, numbers, and characters.
2. All passwords (e.g., email, computer, etc.) should be changed at least once every three months.
3. Don't reuse old passwords.
4. Passwords should not be stored in readable form in computers, notebooks, notice boards, or in any other location where unauthorized persons might discover or use them.
5. Treat passwords as sensitive information and do not share it with anyone.
6. Always use different passwords for every log-in account you have. Using the same password for more than one account risks multiple exposures if one site you use is hacked.
7. If your work requires you to communicate passwords, such as while sending a password for an encrypted file sent as an attachment through email it must be communicated through a different channel such as over a phone call or SMS.
8. Always decline the use of the "Remember Password" feature wherever it is prompted.
9. Remember weak passwords have the following characteristics:
    - The password contains less than 10 characters
    - The password is a word found in a dictionary (English or foreign)
    - The password is a common usage words such as Names of family, pets, friends, colleagues, Movie / Novel / Comics characters, etc. Computer terms and names, commands, sites, companies, hardware, software.
    - Birthdays and other personal information such as addresses and phone numbers.
    - Word or number patterns like 123456, aaaaa, qwerty, asdfg, zxcvb, name@year, etc.
10. Some suggested ways to construct a strong password are as follows,
    - A secure password not only consists of letters, must also use numbers, special characters and caps. One suggested way to replace letters with numbers and special characters, so an "i" will become "!", an "o" turns into a "0" and "s" is written as "$". This way, the simple term "Microsoft" changes to the substantially harder word "M!cr0$0ft".

- Password length matters, the longer the password, the harder it is to crack.
- Think of a sentence and select the first letters of each word in a row will get a complex password and easy to remember as well.

  For example, sentence like this, "My Name is Darsh Swati and I was born on 26 January 1988!" would produce the following password: "MNiDSaIwbo2J1988!". It's long, contains numbers, special characters, caps, and letters, and it's easy to remember and won't be in dictionary.

11. Password history should be enforced wherever possible to ensure that the users are forced to select different passwords with a user account.
12. Maximum password age should be configured to enforce the period (e.g., 90 days) that a password can be used before the system forces the user to change it.
13. Do not reveal a password in email, chat, or other electronic communication.
14. Do not speak about a password in front of others.
15. Do not hint at the format of a password.
16. Do not reveal a password on questionnaires or security forms.

5.4.4 Removable Information Storage Media

Removable Information Storage Media (RISM) means any device which is capable of storing electronic information in any form. Device or media that is readable and/or writeable by the end user and can be moved from computer to computer without modification to the computer.

For example, CDR (multi sessions), CD-RW, DVD-RW, BluRay Disk, MOD, USB Storage devices (Pen Drives, Media Cards, etc.), MP3 Players, MP4 Players, Smart Phones, Digital Camera, Watches with memory, Various types of Memory cards, Internet Data Card, External Hard Disk, or any other gadget having memory space and could be connected to a system through USB or COM or any other ports or device connected through Network Share falls under Removable Information Storage Media.

The amount of data that can be quickly copied to removable storage devices is increasing every day. While these devices can significantly boost productivity, they can also cause dangerously high risks in data security and control policies. External removable portable storage devices allow users to bypass perimeter defenses, including firewalls and email server anti-malware and potentially introduce malware into the office network. Since the malware enters the network from an internal device, it may go undetected until significant damage is caused to the network. Following is some of the best practices to be considered while dealing with Removable storage media:

1. Auto run/ Auto play feature must be disabled for all removable media.
2. The classified data should be encrypted before copying into the removable storage media designated to store classified information.
3. Classified information should be stored only on organization allocated removable storage media for work purposes.
4. The computers should be enabled with the "Show hidden file and folders" option to view hidden malicious files in USB storage devices.
5. It is advisable to scan all removable media with anti-virus software before use.
6. Removable media like USB's, CDs, etc., must not be left unattended.
7. Technical controls may be implemented to restrict the use of portable storage media drives outside of the Government network.

8. Removable media should not be taken out of office unless permitted by the competent authority in your office.
9. In order to minimize physical risk, loss, theft, or electrical corruption, all storage media must be stored in an appropriately secure and safe environment.
10. In case of damage or malfunction of the device, the same should be returned to the designated authority in your office for repair/replacement. Never hand over such devices to outsiders or other vendors for repair as they might have classified information.
11. If the USB device is no longer a functional requirement after issuance, then the same should be returned to the issuing authority.
12. The contents of removable media must be removed/erased after the official purpose has been served.
13. Avoid Baiting. (Someone gives you a USB drive or other electronic media that is preloaded with malware in the hope you will use the device and enable them to hack your computer). Do not use any electronic storage device unless you know its origin is legitimate and safe.
14. Scan all electronic media for Malware before use.

5.4.5 Email Communication

Following is some of the best practices in regards to email communication:

1. Avoid downloading email attachments or clicking on suspicious links received in emails from unknown or untrusted sources.
2. Classified information be not communicated via emails. In case of emergent requirements to do so, the approval of competent authority should be obtained.
3. Avoid accessing official email accounts from public Wi-Fi connections.
4. Auto save of password for email accounts should not be enabled.
5. Logout from mail accounts after your work is done.
6. User should type the complete URL in the browser instead of clicking links received in an email.
7. Do not open / forward / reply to any suspicious e-mails.
8. Be cautious on tiny or shortened URL's (appears like http://tiny.cc/ba1j5y) and don't click on it as it may take you to a malware infected website.
9. Do not open attachments having extension such as EXE, DLL, VBS, SHS, PIF, SCR. Typical example., .txt.exe, doc.exe
10. Enable multi-factor authentication for login into your email client program.
11. Users must check their last login details while accessing the Email account.
12. Use of encryption and digital signature certificate (DSC) may be considered for emails deemed necessary.
13. Email IDs should have a strong password (at least 13 characters with alphanumeric and special characters)
14. Once in every 30 days, the email passwords should be changed.
15. Before opening any attachment, the same should be scanned through an updated anti-virus for malicious contents.
16. Do not keep mails in Inbox, sent box, draft, etc. which are no longer required.
17. Before accepting the SSL certificate, the user should verify the authenticity of the certificate.

18. Make a habit of clearing history from the browser after each logout session.
19. Do not click any URLs mentioned in the body of the E-Mail text until you are sure that it is a legitimate URL.
20. Some malicious program starts executing as soon as they appear on the Outlook Express preview pane. Disable that option (view → layout → uncheck "show preview pane")
21. Don't open unsolicited or unexpected attachments. If you can't verify an attachment is legitimate, delete it.
22. Don't log in to websites or online applications unless the login page is secure (HTTPS).
23. Don't enter personal or sensitive information online unless you are using a trusted, secure web page.

5.4.6 Home Wi-Fi Network

With the mass explosion of Laptops, Smart Phones and Tablets, pervasive wireless connectivity is widely used as an option for connecting to the Internet. Insecure wireless configuration can provide an easy open door for malicious threat actors. In order to secure home Wi- Fi network, following are some of the best practices:

1. Turn on WPA2 or higher encryption feature in wireless routers.
2. Change the default network device name, also known as its service set identifier or "SSID." When a computer with a wireless connection searches for and displays the wireless networks nearby, it lists each network that publicly broadcasts its SSID. It is advisable to have an SSID name which does not disclose your identity in any manner.
3. Change the network device default password. Unauthorized users may be familiar with the default passwords, so it is important to change the router device's password.
4. Consider using the Media Access Control, or " MAC," address filter in your wireless router. Every device that can connect to a Wi-Fi network has a unique ID called the "physical address" or "MAC" address. Wireless routers can screen the MAC addresses of all devices that connect to them, and users can set their wireless network to accept connections only from devices with MAC addresses that the router will recognize.
5. Turn off your wireless router when not needed for any extended period.
6. Update the firmware of wireless devices regularly as it will reduce the number of security loopholes in the device.
7. Disable remote management feature in routers to protect against unauthorized access.
8. Information/Data on the Wi-Fi Network should always be in encrypted form.
9. Do not connect the access point directly to the wired network. As there is a chance of compromised wireless client, in turn, affecting the systems in the wired network, a firewall and an antivirus gateway should be placed between the access point and the wired network
10. Do not auto-Connect to open Wi-Fi Networks.
11. Do not use WEP encryption use WPA2 or higher graded encryption.
12. When the number of users accessing the access point is less, it is recommended to disable the DHCP service. As this may make the attackers easy, to connect to the network once they get associated with the access point.

13. All ADSL Broadband routers should be adequately secured.
14. Disable web and telnet services from outside the network.
15. Change the default passwords of all the network devices.
16. Turn off the Network during extended periods of non-Use.
17. Disable DHCP service.
18. Try to use your ISP DNS rather than open DNS IP addresses.
19. Always configure ISP provided DNS IP address in the computer rather than automatically obtaining the same from ADSL device.
20. If the update option is available in the ADSL device, update the firmware from the legitimate vendor's website.

5.4.7 Avoiding Social Engineering Attacks

Social Engineering is an approach to gain access to information through misrepresentation. It is the conscious manipulation of people to obtain information without realizing that a security breach is occurring. It may take the form of impersonation via telephone or in person and through email. Following is some of the best practices should follow to avoid social engineering attacks:

1. Be careful to unsolicited phone calls, visits, or email messages from individuals asking about personal or other Government information. If an unknown individual claim to be from a legitimate organization, try to verify his or her identity directly with the company.
2. To protect yourself from ***phishing*** do not reveal personal, sensitive, or financial information in email or messages, and do not respond to such emails.
3. Don't reveal any sensitive information over phone calls to protect against ***vishing***.
4. Don't reveal any sensitive information over SMS to be safe against ***smishing***.
5. Avoid online conversations to strangers to be safe from Quid pro quo scams.
6. Be cautious of the URL of a website. Malicious websites may look identical to a legitimate site, but the URL may use a variation in spelling or a different domain (e.g., .com vs. .net). In general, all government websites have gov.in or nic.in at the end of their names. For example, a malicious website may have name as www.mhagov.in or www.mha-gov.in against the actual name www.mha.gov.in
7. It's safer to type a URL into your browser instead of clicking on a link. Hovering over links in email will show the actual URL at the bottom, but a good fake can still steer you wrong.
8. Hacker wants you to act first and think later. If the message conveys a sense of urgency or uses high-pressure sales tactics be skeptical; never let the urgency influence your careful review.
9. If you receive an email from a foreign lottery or sweepstakes, money from an unknown relative, or requests to transfer funds from a foreign country for a share of the money it is guaranteed to be a scam and do not respond and delete such emails.
10. Immediately change any passwords you might have revealed to anyone. If you used the same password for multiple resources, make sure to change it for each account, and do not use that password in the future.
11. Some emails entice the recipient into opening an attachment that activates a virus or malicious program into your computer.
12. Be suspicious of unsolicited phone calls, visits, or email messages from individuals asking about employees or other internal information. If an unknown individual claim to be from a legitimate organization, try to verify his or her identity directly with the company.

13. Do not provide personal information or information about your organization, including its structure or networks, unless you are certain of a person's authority to have the information.
14. Do not reveal personal or financial information in an email, and do not respond to email solicitations for this information. This includes the following links sent in email.
15. If you are unsure whether an email request is legitimate, try to verify it by contacting the company directly. Do not use contact information provided on a website connected to the request; instead, check previous statements for contact information.
16. Install and maintain anti-virus software, firewalls, and email filters to reduce some of this traffic.
17. Take advantage of any anti-phishing features offered by your email client and web browser.
18. Immediately change any passwords you might have revealed. If you used the same password for multiple resources, make sure to change it for each account, and do not use that password in the future.

5.4.8 Smart Device (Smart Phone, Tabs, etc.)

The smart device is a device having any of the features like computation power, Internet access, storage capability, camera, recordings, GPS, etc. Smartphone, Tablets, etc. falls under this category. Most of the Smart Phones and Tablets (Tabs) are having equal computing power to normal Desktop / Laptop systems. These gadgets are capable of delivering many services on Video, Voice, GPS, and other computational apps like any other computer. Therefore, all cyber security issues related to computers are also applicable to these devices. Some important practices for safeguard are enlisted:

1. Smart devices must not be used for sensitive telephonic conversation. The Wi-Fi and blue-tooth should be kept in turned-off mode.
2. A low-end basic mobile phone without a camera/internet / Wi-Fi may be carried for sensitive voice conversation and contact details.
3. Internet connection in the Smart device will normally be kept in off-mode and it will be made 'on' on a need basis to access the internet.
4. No free Apps should be loaded in the Smart device.
5. During repairs, don't leave the device unattended to protect it from malware installation.
6. Relevant anti-virus software should be installed in the smart device too.
7. If the Smart device gets de-activated for any reason for a few hours/one day, the service provider should be contacted immediately to ascertain the reason for deactivation.
8. If the battery gets unusually discharged very fast or the device gets heated up without any user activity, then it is very likely some malicious traffic is consuming the battery.
9. Free Wi-Fi should not be used at public places such as airports. Turn off blue-tooth and Wi-Fi when the use of the same is not required for operational purposes. Even when the same is in use, set the default blue-tooth / Wi-Fi configuration to "non-discoverable".
10. A compromised smart device should not be connected to a computer even to charge.
11. Turn off the applications which are not needed.
12. When a device is idle, it should get locked and require a password/pin or swipe pattern. Set the device to lock in a relatively short time.
13. Don't reply or click on the link on SMS or messages sent by strangers.
14. Don't jail-break your device as jail-breaking removes the restrictions on which apps can be installed or not installed. This removes the protection set by the company.
15. Watch for unauthorised GPRS/data connection during an idle mode of the Smart device.

16. Check the memory frequently if any unusual data is stored there. Malware stores temporarily, the data collected in the memory of the phone till the same is sent to the destination.
17. A suitable non-transparent tape/sticker may be applied to block the camera view.
18. Think before you click, download, forward, or open. Before responding, registering, downloading, or providing information, get the facts.
19. Understand the terms of use. Some applications claim extensive rights to accessing and leveraging your personal information. If the app requires more access to your account and/or device than is needed to run the service, do not continue. In addition, be aware that terms can change over time. Review your terms of use often.
20. Be cautious with public Wi-Fi. To be safe, avoid logging into accounts, especially financial accounts when using public wireless networks.
21. Disable Bluetooth and Near Field Communication (NFC) capabilities when not in use.
22. Enable encryption. Enabling encryption on your Smartphone is one of the best ways to safeguard information stored on the device, thwarting unauthorized access.
23. You must wipe the information from your smartphone before disposal. Additionally, make sure any SD cards are removed and erased. If you are not redeploying the SIM card to another device, then make sure your personal information stored on the SIM card is erased or destroyed.

Checklist for secure android device

There are many ways to make an Android device is safe and secure. A few of these are listed here:

1. Implementing basic security (screen security): Users can choose from the standard device PIN, password, pattern lock, biometric unlock and swipe (swipe is not a secure method). Screen lock can be set from settings → screen security → screen lock.
2. SIM PIN: users should consider setting up a SIM PIN. With this option enabled, the device will ask for the SIM PIN every time it boots up.
3. Encryption: Android 2.3.4 and later versions support device encryption. Though this is must-have security feature but in case this is not available in your device, users can use external apps such as Secret Space Encryptor (SSE), Encryption Manager, etc.
4. Passwords: Passwords should not be made visible. Users should make sure that this feature remains disabled at all times.
5. Multiple user accounts: Tablets running on Android 4.2 + (Jellybean) provide an option to create separate user profiles for different users. This is helpful if the device is being shared by multiple family members. This feature can be found under Settings → device → users. or System → Multiple users or search user in your system settings.
6. Device Administration: Device Administrators are apps that can control certain features of the device. For example, when an anti-virus app is installed, it becomes a device administrator. It can erase all data on the device, set password rules, etc. on the user's behalf.

   The 'Unknown Sources' feature allows the user to side load apps or installs apps provided by a third-party app store. Apps installed via this mode might contain some malicious code, which could pose a risk to the user's data. This option should remain disabled for normal users.
7. Mobile Security Suite: Installing a mobile security suite is a must. All the leading anti-virus companies provide a mobile version of their product. A mobile security suite provides a wide variety of features along with an anti-virus.
8. Device backup: Users should regularly back up the data on their devices. By default, Android provides an option to back up the configuration and settings. This is available under settings → Personal → Backup & Reset. However, it does not back up data stored on the device. Device

data can be backed up either by using the desktop software suite for the device or via third party apps.

9. Mobile Device Management: Many users bring their devices and connect the same to their organization network. Leading to data leakage and other security compromise. To counter such risks, MDM solutions (Mobile Device Management) need to be deployed by the organizations.
10. Application Permission: No apps should be allowed to access the device resources without the consent of the user. Use should refrain from installing apps that look suspicious and asks for other resources for accessing.
11. Application Locks: If a device is changing hands, users might want to protect their personal data (SMS, Pictures, Emails, etc.) from prying eyes. An application lock is an answer to this problem. By installing apps users can put a password on apps that store personal data. Once implemented, a password protected app will ask the user for a PIN before launching.
12. Transaction Passwords: Users can set transaction passwords for selected App Stores.
13. Rooting Device: Android, ROMs shipped with devices; do not provide root (superuser privilege) access, by default. While many users do not require root privileges on their devices, advanced users and developers often like to experiment with their devices but it's dangerous.
14. Digital wellbeing & parental control: These should be configured cautiously to reduce screen time.
15. Don't make your mobile phone a source for your personal data, which is dangerous if it falls into the hands of strangers. It is advisable not to store important information like credit card and bank cards passwords, etc. in a mobile phone.
16. Note the IMEI code of your cell phone and keep it in a safe place. This helps the owner to prevent access to the stolen mobile. The operator can block a phone using the IMEI code.

Activity 2

Check permissions of your android device with system's permission manager. Make a list of permissions against allowed and denied Apps.

5.4.9 Social Networking

1. Do not store any information you want to protect on any device that connects to the Internet.
2. Always use high security settings on social networking sites, and be very limited in the personal information you share. Monitor what others are posting about you in their online discussions.
3. Use anti-virus and firewall software. Keep them and your browser, and operating systems patched and updated.
4. Change your passwords periodically, and do not reuse old passwords. Do not use the same password for more than one system or service. For example, if someone obtains the password for your email, they can access your online banking information with the same password.
5. Do not post anything that might embarrass you later, or that you don't want strangers to know.
6. Do not automatically download, or respond to content on a website or in an email. Do not click on links in email messages claiming to be from a social networking site. Instead, go to the site directly to retrieve messages.
7. Only install applications or software that come from trusted, well-known sites. "Free" software may come with malware.

8. Avoid accessing your personal accounts from public computers or through public Wi-Fi spots.
9. Disable Global Position System (GPS) encoding. Many digital cameras encode the GPS location of a photo when it is taken.
10. If that photo is uploaded to a site, so are the GPS coordinates, which will let people know that exact location.
11. Whenever possible, encrypt communications with websites. It may be a feature (like HTTPS site rather than HTTP site) social network sites allow you to enable.
12. Beware of unsolicited contacts from individuals in person, on the telephone, or on the Internet who are seeking corporate or personal data.
13. Monitor your bank statements, balances, and credit reports.
14. Do not share usernames, passwords, credit cards, bank information, salaries, computer network details, security clearances, home and office physical security and logistics, capabilities and limitations of work systems, or schedules and travel itineraries.
15. No legitimate service or network administrator will ask you for your password.
16. Do not provide information about yourself that will allow others to answer your security questions—such as when using the "I forgot my password" feature.
17. Be thoughtful and limit the personal information you share such as job titles, locations, hobbies, likes, and dislikes, or names and details of family members, friends, and co-workers.
18. Verify those you correspond with. It is easy for people to fake identities over the Internet.
19. Do not click advertisements shown on the social web pages.

Registering an account

1. Use a strong password different from the passwords you use to access other sites.
2. If you are asked to provide security questions, use information that others would not know about you.
3. Never provide a work-associated email to a social network, especially when signing up. Consider creating a new email address strictly to connect with your social networking profile(s).
4. Do not use your real name
5. Provide only information that is necessary or that you feel comfortable providing. When in doubt, err on the side of providing less information.
6. During the registration process, social networks often solicit a new user to provide an email account password so the social network can access the user's email address book. The social network promises to connect the new user with others they may already know on the network. To be safe, don't provide this information at all.

5.4.10 Instant Messaging (IM)

Instant Messaging networks provide the ability to not only transfer text messages, but also the transfer of files. Consequently, IM can transfer Malware and other programs. Many IM allows peer-to-peer file sharing, a malware can configure the IM client to share all files on the system with full access to everyone.

Hackers can impersonate other users in many different ways. The most frequently used attack is simply stealing the account information of an unsuspecting user. WhatsApp, messenger, telegram, WeChat are few examples of Instant Messaging networks.

1. Careful when creating a screen name. Each IM program asks you to create a screen name.

Screen names should not provide or allude to personal information. Use a nickname instead of a full name.

2. Never provide sensitive personal information. Do not share credit card numbers/ passwords. Etc. over IM.
3. Create a barrier against unwanted IM. Do not list your name or email address in public areas or to strangers.
4. Only communicate with people who are on your contact lists. If you decide to meet a stranger that you know only from IM communication, take appropriate safety precautions. For example, do not meet that person alone, take a friend or colleague with you. Always meet and stay in a public place such as a cafe or other places.
5. Never open pictures, download files or click links in messages from people you do not know.
6. Do not send personal or private IM at work.
7. If you use a public computer, do not select the feature that allows you to log on automatically.

5.4.11 Online transaction / ATM

1. Before you buy, check out the reputation of store and the seller through website reviews or physical address veri?cation to ascertain the legitimacy of the party you are going to deal with. Keep in mind however that online reviews can be manipulated to credit or discredit reputation.
2. Be aware of what details legitimate sites ask for before entering into a transaction.
3. Be wary of unsolicited mail, especially those with email attachments and embedded links.
4. Learn to distinguish bogus communications that claim to be from banks, auction sites, and other financial institutions, specifically those asking for personal or account information as these are never requested electronically by institutions.
5. Review financial and credit card statements for unknown expenses. Incorrect entries or suspicious transactions serve as a warning bell that online financial accounts are compromised. If so, contact the financial institution immediately, consider reporting the attack to the police, reset online pass-words, ATM PINs, and check for malware on your home computer
6. Cancel unused debit/credit cards (cutting them up is not enough).
7. Check your credit card statements and immediately report unauthorized purchases.
8. Never write down PINs and passwords: memorize them.
9. Always use phishing filters in your Internet browser.
10. Be cautious while providing bank details online, before proceed further confirm with the bank about the email you received. Think that if something is important or urgent why don't bank calling me instead of sending an email?
11. Delete all cookies and history files before you perform online transactions.
12. Always use a virtual keyboard while accessing online banking.
13. Register your mobile number and email with banking transactions for timely SMS and Email alerts. Use multi-factor authentication (MFA) to log on to your banking website.
14. Vishing is a form of phishing, where instead of people receiving an email to lure them into giving personal information, the criminal uses a phone call, either live or automated, to attack the bank or credit union customer and get critical information.
15. While you receive the money, you will never ask to provide your credentials.
16. Be cautious while scanning QR codes for payments it has very similar consequences like fraudulent hyperlinks or short URLs.

Automated Teller Machine (ATM)

Automated teller machines are electro-mechanical machines adopted by the international community for banking transactions in the present digital era. Few safeguards for its usage are as under:

1. Always protect your PIN, Do Not give the number to anyone
2. Cover the keypad while you are entering the PIN.
3. Do not operate ATM in lonely places / unguarded ATMs.
4. Be wary of anything about the ATM that looks out of the ordinary, such as odd-looking equipment or wires attached to the device.
5. Look for a "no tampering" sign. Crooks often place these to stop anyone curious about a new piece of equipment.
6. Regularly check bank accounts to make sure that no unusual or unauthorized transactions (even smaller amounts).

5.4.12 Public Computer

1. If you store or download any personal information on a Desktop in a cybercafe make sure you delete all the documents after you're done with your work.
2. When surfing the Internet, you should always check the browser's security aspects.
3. Beware of keyloggers, these are spyware and logs or records your keystrokes so that your username and password are made available to the Cybercafe owner or any Attacker. These records may type into directly into Hacker's machine or collected afterward through a file transfer. Some cybercafes may use Hardware key loggers so that you check that there is an intermediate device between your keyboard and CPU.
4. Cybercafe computers are public computers and shared computers. Your data or communication may be exposed to all users at the same time. So be aware that sensitive information like personal details like username, passwords, etc. should be deleted.
5. Whenever you go to Cybercafe, you ensure that it has up-to-date Anti-virus and Anti-spam software. These may help to stop some of the key loggers, Trojans, and other malware.
6. Don't leave the computer unattended with sensitive information on the screen.
7. Don't enter sensitive information into a public computer.
8. Always make sure to log out properly when you leave Cybercafe.

ONLINE QUIZ AND VIDEO RESOURCES

You can participate to evaluate yourself and even get a certificate by attending an online quiz hosted on the InfoSec awareness website of C-DAC, Ministry of Electronics and Information Technology (MeitY), Govt of India.

TYPE: An Online Quiz **Title:** Password Security

TYPE: An Online Quiz **Title:** Email Security

TYPE: An Online Quiz **Title:** Browser Security

TYPE: Video Resource **Title:** Firewall Security

SUMMARY

1. The digital world is ubiquitous. It is limitless having no physical or geographical boundaries.
2. Adhering to information security best practices, the security of the overall IT system can strengthen.
3. Information security aims to protect InfoSec triads i.e., confidentiality, integrity, & availability.
4. There exist many threads to InfoSec e.g., malware, social engineering, physical security.
5. Malware is short for malicious software and is used as a single term to refer to viruses, trojan horses, worms, spyware, etc.
6. There are many ways by which malware can approach our system e.g., downloaded directly from the internet, email, tricked removable device, network propagation, etc.
7. Social engineering is a general term for attackers trying to trick people into revealing sensitive information or performing certain actions.
8. A firewall is not a panacea for security but it is a mandatory first layer of defence.
9. Cookies are used to store a website's information about the user, on the user's computer.
10. Various tools and techniques are used to protect computer systems from InfoSec threats e.g., firewall, antivirus software, VPN, backup, cryptography techniques, authentication, authorization, digital signature, etc.
11. Information security enhances with the knowledge of technology as well as by adopting the best practices of using it.

EXERCISES

A. Objective Questions

Q1. What is the application used to access the information and resources on WWW known as?

A. Web browser
B. Webserver
C. Web matrix
D. None of the above

Q2. It is a hardware device or program that filters the information coming through an internet connection to a network or computer system.

A. Cyber safety.
B. Anti-virus
C. Cookies.
D. Firewall

Q3. What's the name of the technology that the Chrome browser uses to keep you safe from malware and phishing?

A. Protected Browsing
B. Secure Browsing
C. Safe Browsing
D. Internet tracking

Q4. What is the private information that you should always avoid sharing on social media platforms?

A. Financial Information like Debit card / Credit card details, bank details
B. Address, mobile numbers, Date of Birth, Place of Birth
C. Favorite food, hobbies, movies, music etc.,
D. All of the above

Q5. A type of program that demands payment after launching a cyber-attack on a computer system

A. Ransomware
B. Malware
C. Virus
D. Trojan

Q6. Strong passwords can be difficult to remember, what can you do to avoid forgetting them?
A. Use mnemonics (acronyms or phrases that are easy for you to remember)
B. Develop a password strategy
C. Use password management software with encryption
D. All the above

Q7. what is a good way to protect sensitive information sent via email?
A. Encrypt the email
B. Write it in another language
C. Don't include return address
D. All of the above

Q8. What are the major security threats that can be expected through an email?
A. Spam, Virus, Malware, Phishing, Vishing
B. Malware, DoS attack, Malware attacks, Vishing
C. Spam, Virus, malicious links, phishing, spoofing, ransomware
D. Man in Middle attack, DoS attack, Vishing, Malware

Q9. Which site will be redirected to, upon clicking a link received through email from an unknown source which can automatically install malware in the system?
A. Official vendor's site
B. Security solution site
C. malicious site
D. software downloading site

Q10. what do you do, if you are in a gaming room and someone that you do not know asks you about the personal information (same age as you or close)?
A. Tell them just a little bit about yourself
B. Don't ever give out any personal information.
C. Don't trust what people say on the internet.
D. B & C

Q11. What is a digital footprint?
A. A scanned image of your foot
B. A photograph of your shoe
C. All the information online about a person that is stored online
D. Having a blog, facebook or twitter page

Q12. Which of the following is used to identify a website user and can be a vulnerability to your privacy if not cleared regularly?
A. Pop-ups
B. Cookie
C. Plug-ins
D. Scripts

Q13. Which of the following message attachments are not to be opened? A message with an attachment that:
A. Appears more than once in your Inbox
B. A sample copy of a new game from a unrecognized company e-mail address
C. Is an unexpected note from a friend
D. All of the above

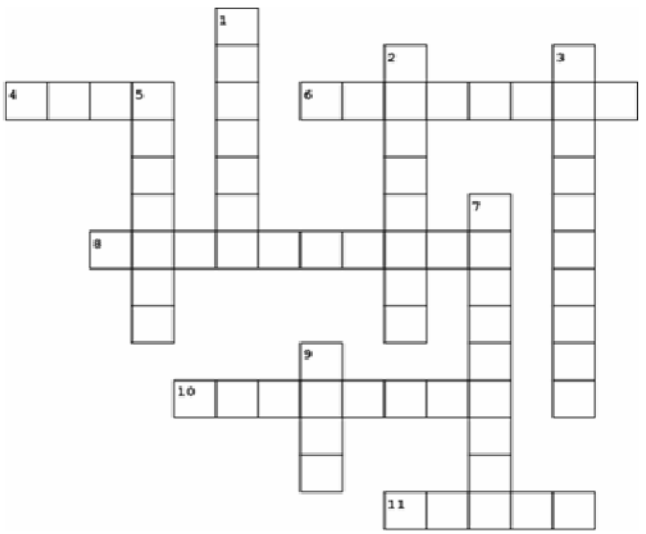
Q14. Is it safe to receive or attend WhatsApp video calls from unknown numbers?
A. Yes, it helps us to get to know the person calling us.
B. No, as it can be from culprits attempting to trap you with inappropriate video content.
C. Yes, it is a good way of interacting with others.
D. I do not know

Q15. What are the features that you should always enable on your social media accounts?
A. Security and privacy features
B. Trending ads and videos
C. latest updates and pictures.
D. None of the above

B. Subjective Questions

Q1. What do you understand by malware? Explain various types of malwares.
Q2. Explain the members of the information security triad.
Q3. What are the best practices for Information security while surfing the internet?
Q4. What are the threats which may harm your system even if it is not connected to the internet?
Q5. Describe one method of multi-factor authentication that you have experienced and discuss the pros and cons of using multi-factor authentication.

C. Crossword



Across		Down	
4.	this creates unnecessary junk in the receiver's email	1.	when user access certain website small files downloaded on to the computer
6.	is the practice of sending fraudulent communication that appears to come from a reputable source	2.	it is a network security system designed to protect a trusted private network from unauthorized access
8.	it blocks the user to access his own data and give threats	3.	the process of encoding a message to hide original content
10.	secretly listening to a conversation	5.	the short term used for malicious software
11.	a piece of software code created to perform malicious activities	7.	the software to record the keystrokes of user
		9.	is also a malware that does damaging activity on an infected computer

ANSWERS

A. Objective Questions

Q.N.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Option	A	D	C	D	A	D	A	C	C	D	C	B	D	B	A

B. Hints for Subjective Questions

A1. Malware is software created to fulfill malicious intentions. Explain in detail ransomware, trojan, worm, spyware, adware, keylogger, virus, sniffer, backdoor, etc.

A2. Explain information security goals i.e., confidentiality, integrity & availability (Refer Fig. 5.2).

A3. Explain InfoSec best practices especially for internet browsing, email communication, instant messaging & social engineering.

A4. discuss best practices of general computer usage, threats of removable media, physical security, in computer usages practices, etc.

A5. Receiving one-time passwords (OTP) on SMS service during withdrawal of money from SBI bank ATM machine is an example of multifactor authentication. Similarly, various IT services are only provided by means of authentication (MFA) via authenticator app on your smartphone i.e., kavach app for the government officials to access email service, google or Microsoft authenticator app to access their cloud services.

MFA requires a separate channel for communication, which should be available for real-time service delivery e.g., we should get SMS or notification instantly to complete our ongoing transaction. The requirement of a smartphone or other hardware is another dependency.

C. Crossword

Across: 4- spam, 6-phishing, 8-ransomware, 10-snooping, 11-virus

Down: 1-cookies, 2-firewall, 3-encryption, 5-malware, 7-keylogger, 9-worm

KNOW MORE

Even after taking utmost security precautions and adhering to InfoSec best practices, there are chances of security breaches.

1. Occurrence of any InfoSec incident or vulnerability can be reported to Computer Emergency Response Team (CERT-IN) on URL: *https://www.cert-in.org.in*
2. An Indian citizen can avail the facility of advisories and vulnerability notes via subscribing to the mailing list of Cert-In on the above URL.
3. The occurrence of any cybercrime should be reported to local police and the Government of India's official portal i.e., www.cybercrime.gov.in.
4. Suspicious files, shortened URLs, risky URLs can be analyzed to check whether they are legitimate file/ URLs or associated with malware. URL: *https://www.virustotal.com/gui/*

Applications

Nowadays, there are numerous applications for information security. Few applications are as under:

- Email Security: Email service is popular internet service since decades. It is also widely being misused for the hackers for their social engineering victimization process. It is advised to install software to secure the access and content of your email accounts.
- Application Security: Securing applications such as software packages used in laptop, apps used in mobile from unauthorized access and preventing data leakage is important an application.

- Security for Cloud Services: Keeping cloud infrastructure secure is very important. Service level architecture and privileges of online accounts such as Google account, One Drive etc. should be kept secure.
- Security for Internet of Things (IoT): IoT used for many applications such as Smart home, Smart City, Intelligent Transport system, Health care, Agriculture. Securing these applications from data leakage, data modification are important aspects in the real-world application.
- Security in Driver-less Cars: Nowadays, the autonomous car or driverless car become important research. The driving of the car uses sensors and real time data, and hence any changes in the data may lead to loss of human being. Hence securing the driverless car is most important by means of protecting real time data of driverless car.

PRACTICALS

Experiment 5.1: Operating System Security Features and Tools

Practical Statement

Explore security features of Operating Systems and Tools, try using them, and see what happens.

Practical Significance

The built-in security features provided by any operating system are considered as one of the core properties of an operating system. It is important for every computer user to use these features and tools provided by the OS to protect their privacy and valuable data.

Relevant Theory

Protection with BIOS and UEFI

Modern computers come with Unified Extensible Firmware Interface (UEFI). The firmware setting can control our computer system's hardware at the lowest level. We can enable or disable, any hardware like USB ports, cameras, sound cards, etc. If the physical access to our computer system goes into the wrong hands, then it is possible that our system may be breached through live USB / DVD. To avoid such a situation, it is necessary to secure the boot order change of the BIOS and allow booting from the hard disk only. Security should be enhanced by setting a password on UEFI and enabling secure boot settings.

User Accounts

When we are logged on to the computer with some user account there are some privileges associated with the user. Windows OS specifies two types of user accounts i.e., the standard user and privileged user. The standard user account is given less privilege to change the settings of the system or install other software, than the privileged account. In the standard user account, the system becomes secure due to the malware not getting the necessary permissions. Therefore, understand it as a thumb rule that if we want to make changes in the settings of the system, then only log on with the Privilege user Account.

Data Encryption

Encryption is used in computer systems to protect data from evil eyes. Current operating systems also provide the facility of full disk encryption and our entire hard disk can be encrypted. The feature is

present in Ubuntu 20 core and Windows 10 (except Home editions). Windows 10 has a utility called BitLocker for the same. In addition to OS tools, privacy and security can be enhanced from third-party software e.g., DiskCryptor, Veracrypt, 7-Zip, etc.

Firewall

Firewalls act as a barrier between our network and the outside world. These are used to filter incoming packets based on certain parameters such as packet size, source IP address, protocol, and destination port. Various rules can be defined to allow or deny packet movement from inside to outside or vice versa. Ubuntu has a firewall named "Uncomplicated Firewall" (UFW) whereas "Windows Defender Firewall" is used in windows 10.

Backup & Recovery

There are backup and recovery tools in operating systems that act as a panacea in tough times. There is also such an option in Windows 10 by which we can back up the desired folders. Through this, the frequency and time interval of backing up are also configured.

Practical Outcomes (PrO)

The learners will be able to:

PrO1: protect themselves with help of Bios and UEFI.
PrO2: define user accounts and create a standard user account in Windows 10.
PrO3: encrypt hard disk drive with BitLocker utility of Windows 10.
PrO4: configure backup for desired folders, set backup frequency and retention time.
PrO5: turn on the Microsoft Defender firewall on Windows 10.

Resources Required

1. A computer system i.e., any of PC/Laptop.
2. An installed Operating system i.e., Windows 10 or Ubuntu.

Precautions

1. In case of setting up a UEFI password memorize it or keep it at a safe place.
2. During user account creation, provide minimum permissions to users.
3. While encrypting data encryption key is very important, losing a key is equals to losing data.
4. The backup strategy should keep data safer but with lesser memory requirements.
5. Allowing and denying IPs, applications via firewall rules should be done cautiously to remain connected with legitimate users and applications.

Suggested Procedure

Setting UEFI Password

1. Turn on the computer and press either the Escape, Delete, F2, F10, or F12 key.
2. Enter the Setup/BIOS/UEFI and Navigate to the advance settings page (F7)
3. Click on the Security tab.
4. Under the Security tab, you will see the Administrator and User Password. Go ahead and set two separate passwords for the Administrator and User accounts.
5. You should now see the Administrator and User password status showing as "Installed".
6. Proceed over to Save & Exit to save and exit. You might have to hit F-10 on the keyboard to Save & Exit.

7. The computer should now restart prompting you for a password immediately. You can also go back into the UEFI and test the Administrator or Supervisor password as well.

Fig. 5.3: UEFI Password Screen

Restricting Boot Order

Changing Boot sequence is also elaborated in chapter 2 (refer to Fig. 2.4). We will follow the below steps to restrict the booting other than hard disk:

1. Boot the system into the UEFI settings.
2. Navigate to the Advanced (F7) portion of the UEFI.
3. Click on the Boot Options tab.
4. You will see "Boot Option #1". Set this to your internal Hard Drive.
5. If you have "Boot Option #2" or more, you should Disable each one.
6. Navigate to Save and Exit or press F10 on your keyboard.
7. Go back into the UEFI setting and verify the changes are set.

Creating a Standard User Account

1. Click on the Windows "Start" Icon.
2. Scroll down to the "Windows System" folder and click the arrow to expand.
3. Navigate to Control Panel → User Accounts → User Accounts by clicking each option.
4. Now, click on Manage Another Account → Add a user account.
5. At the bottom, click on "Sign in without a Microsoft Account (not recommended)".
6. At the bottom, click on "Local account" and fill in the "User name, Password, and Password hint. Click Next when complete".
7. Click on "Finish". You should now be back at the "Manage Accounts" window. A new user account on the system is created.
8. Log off and Log on to verify.

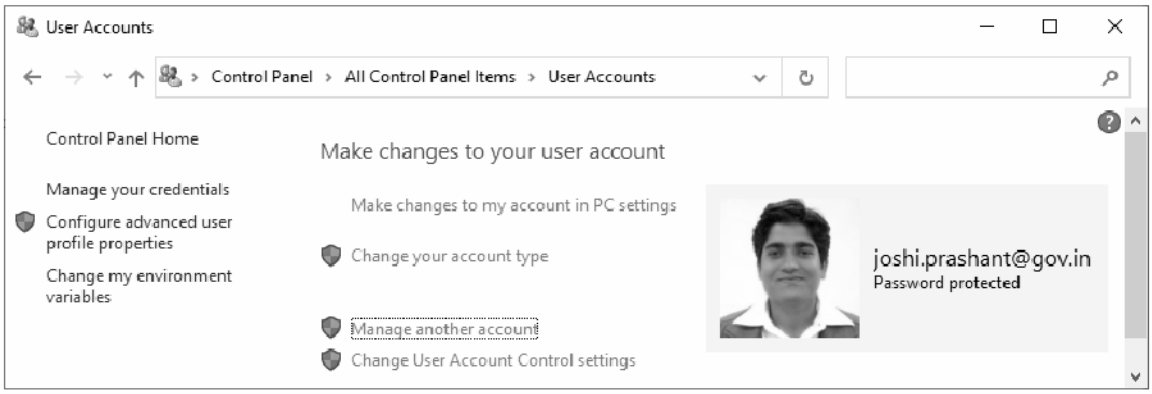


Fig. 5.4: A Standard User Account in Window 10

Encrypt Hard drive with BitLocker

1. Locate the hard drive you want to encrypt under "This PC" in Windows Explorer.
2. Right-click the target drive and choose "Turn on BitLocker."

3. Choose the "Enter a Password" option and enter a secure password.
4. Select "How to Enable Your Recovery Key" which you'll use to access your drive if you lose your password. Various options are provided like print, save it as a file to your hard drive, save it as a file to a USB drive, or save the key to your Microsoft account.
5. Choose "Encrypt Entire Drive." This option is more secure and encrypts files you marked for deletion.
6. Unless you need your drive to be compatible with older Windows machines, choose "New Encryption Mode."
7. Click "Start Encrypting" to begin the encryption process. Note that this will require a computer restart if you're encrypting your boot drive. The encryption will take some time, but it will run in the background, and you'll still be able to use your computer while it runs.

Backup in Windows 10

1. Navigate to Update & Security by navigating to Start → Settings → Update & Security
2. Select the "backup" option from the left pane and then on the right pane Under "Back up Using File History", click Add a Drive. A window will open asking you to select the drive you wish to back the files up to. By this time your computer system should have a USB Pen drive or other internal hard disk installed.
3. Click on "More Options" under "Back Up Using File History".
4. The folders which will be backed up are listed under "Back-Up These Folders". If you see a folder you do not wish to backup, click on the folder and click "Remove".
5. If you wish to back up a folder not listed under the "Back Up These Folders", you will want to click on "Add a Folder". The "Select Folder" window will open. Click on the desired folder and click "Choose This Folder".
6. Under "Overview", you can set when and how long to keep files backed up. Under "Back Up Files", I set mine to "Daily" and under "Keep My Backups", I leave it at the default setting "Forever". When ready, you will need to click "Back Up Now".

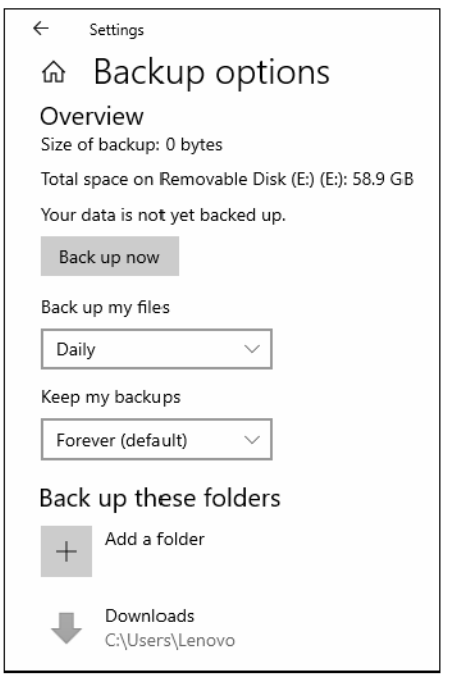


Fig. 5.5: Windows 10 Backup Options

Now if you navigate to the drive you selected, you will see a folder called "FileHistory". This is the location of the folders you have just backed up.

Turning on Microsoft Defender Firewall

1. Select the Start button → Settings → Update & Security → Windows Security and then Firewall & network protection. Open Windows Security settings.
2. Select a network profile.
3. Under Microsoft Defender Firewall, switch the setting to On. If your device is connected to a network, network policy settings might prevent you from completing these steps. For more info, contact your administrator.

4. To turn it off, switch the setting to Off. Turning off Microsoft Defender Firewall could make your device (and network, if you have one) more vulnerable to unauthorized access.
   A self-explaining easy GUI is depicted in Fig. 5.6.

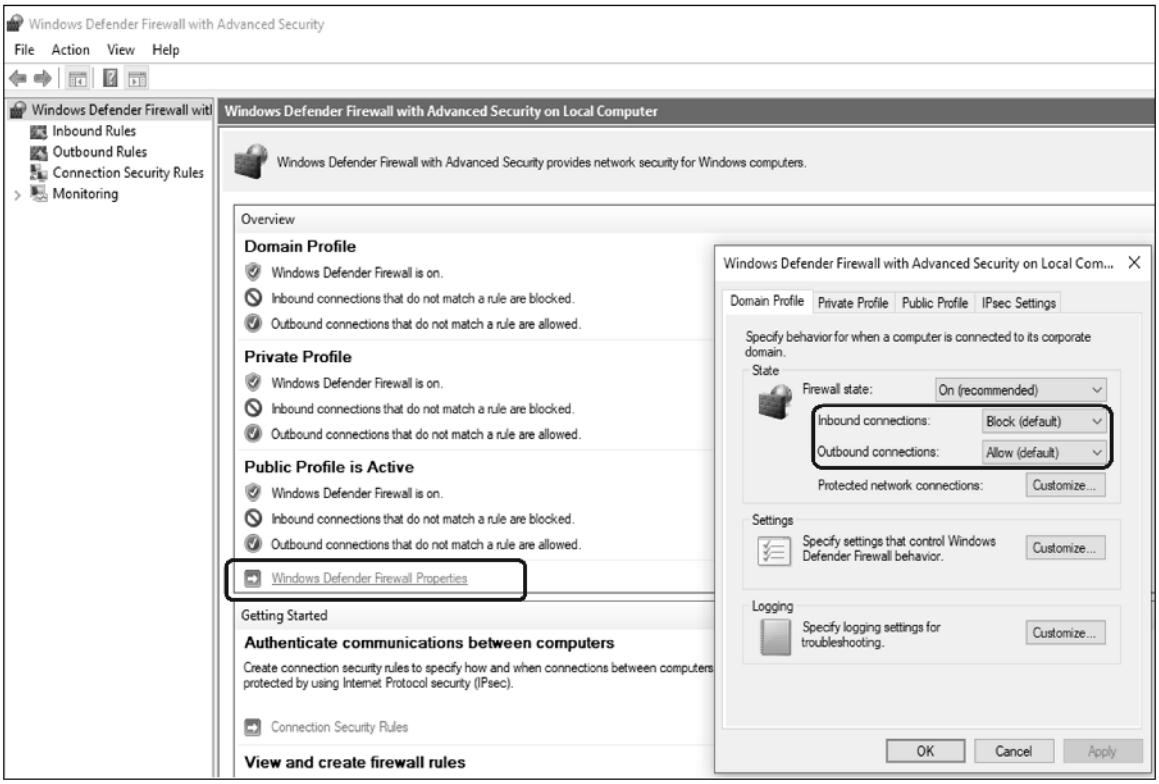


Fig. 5.6: Windows Defender Firewall

Ubuntu OS 20.04 also has an inbuilt firewall named an uncomplicated Firewall (UFW). We can configure our rules for incoming and outgoing packets based on or work type and requirement. Command-line interface or GUI both are available. A self-explaining easy GUI is depicted in Fig. 5.7.

Fig. 5.7: GUI of UBUNTU's Uncomplicated Firewall (UFW)

Practical Related Questions

Note: Below given are few sample questions for reference.

1. What are the safeguards provided by setting up passwords to BIOS and UEFI?
2. How users can encrypt their data with OS? Name some third-party software too.
3. Set up a rule to block the FTP port of your system.
4. Create a user account named "AICTE" in your OS.
5. How do you configure an automatic backup of your specified folders after every 12 hours in Windows 10 operating system?

Suggested Learning Resources

[1] Tyler S Payne , *WINDOWS 10, Improving Privacy & Security*. 2020.

[2] M. Meyers, *Mike Meyers' CompTIA A+ guide : essentials : exam 220-701*. New York: Mcgraw-Hill, 2010.

Suggested Assessment Scheme

The given performance indicators should serve as a guideline for assessment regarding process and product related marks.

Performance Indicators		Weightage	Marks Awarded
Process Related: ..... Marks* (..... %)			
1.	Environment Readiness by student	10	
2.	Explanation of practical components i.e., section 1.2 to 1.7	20	
3.	Procedure adoption and step-by-step explanation	10	
4.	Viva voce	10	
Process Related: ..... Marks* (.....%)			
5.	Password setting to BIOS and UEFI & Restricting Boot Order Change	10	
6.	User Account creation	10	
7.	Use of data encryption tool	10	
8.	Turning on the Firewall and setting rules.	10	
9.	Setting up automatic backups.	10	
	Total	**100%**	

* Marks and percentage weightage for product and process assessment will be decided by the teacher.

Name of the Student:..... **Marks Awarded**			**Signature of Teacher with date**
Process Related	Product Related	Total	

REFERENCES AND SUGGESTED READINGS

[1] "A Document on Information Security Best Practices by Ministry of Home Affairs, Government of India."

[2] "A Document on Information Technology Security Best Practices by Ministry of Tourism, Government of India."

[3] "National Information Security Policy and Guidelines (NISPG 5.0)," Ministry of Home Affairs, Government of India.

[4] "National Cyber Security Policy, 2013," Department of Electronics and Information Technology, Government of India.

[5] "Topics," *ISEA*. https://www.infosecawareness.in/topics (accessed Aug. 10, 2021).

❑❑❑

ANNEXURE

CO AND PO ATTAINMENT TABLE

Course outcomes (COs) for this course can be mapped with the programme outcomes (POs) after the completion of the course and a correlation can be made for the attainment of POs to analyze the gap. After proper analysis of the gap in the attainment of POs necessary measures can be taken to overcome the gaps.

ANNEXURE A: Table for CO and PO attainment

Course Outcomes	Attainment of Programme Outcomes *(1- Weak Correlation; 2- Medium correlation; 3- Strong Correlation)*											
	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1												
CO-2												
CO-3												
CO-4												
CO-5												
CO-6												

The data filled in the above table can be used for gap analysis.

APPENDICES

Shortcut keys enable computer users to operate desktop and applications more efficiently & conveniently. This section lists various shortcut keys or key combinations for performing task in alternative way which generally performed via mouse.

APPENDIX A: Shortcut Keys for Web Browsers

KEY	ACTION
TABS	
Ctrl+1-8	Switch to the specified tab, counting from the left
Ctrl+9	Switch to the last tab
Ctrl+Tab	Switch to the next tab (tab on the right)
Ctrl+Shift+Tab	Switch to the previous tab (tab on the left)
Ctrl+W, Ctrl+F4	Close the current tab
Ctrl+Shift+T	Reopen the last closed tab
Ctrl+T	Open a new tab
Ctrl+N	Open a new browser window
MOUSE ACTIONS FOR TABS	
Middle Click a Tab	Close the tab
Ctrl+Left Click, Middle Click	Open a link in a background tab
Shift+Left Click	Open a link in a new browser window
Ctrl+Shift+Left Click	Open a link in a foreground tab
NAVIGATION	
Alt+Left Arrow or Backspace	Back
Alt+Right Arrow or Shift+Backspace	Forward
F5	Reload the Webpage
Ctrl+F5	Reload and skip the cache
Escape	Stop
Alt+Home	Open homepage
ZOOMING	
Ctrl and + or Ctrl+Mousewheel Up	Zoom in
Ctrl and – or Ctrl+Mousewheel Down	Zoom out
Ctrl+0	Default zoom level
F11	Full-screen mode
SCROLLING	
Space or Page Down	Scroll down a frame
Shift+Space or Page Up	Scroll up a frame
Home	Top of page
End	Bottom of page
Middle Click	Scroll with the mouse. (Windows only)
ADDRESS BAR	
Ctrl+L or Alt+D or F6	Focus the address bar to start typing
Ctrl+Enter	Prefix www. and append .com

SEARCH	
Ctrl+K or Ctrl+E	Focus the browser's built-in search box
Alt+Enter	Perform a search from the search box in a new tab
Ctrl+F or F3	Open the in-page search box to search on the page
Ctrl+G or F3	Find the next match of the searched text on the page
Ctrl+Shift+G or Shift+F3	Find the previous match of the searched text on the page
HISTORY & BOOKMARKS	
Ctrl+H	Open the browsing history
Ctrl+J	Open the download history
Ctrl+D	Bookmark the current website
Ctrl+Shift+Del	Open the Clear Browsing History window
Other Functions	
Ctrl+P	Print the current page
Ctrl+S	Save the current page to your computer
Ctrl+O	Open a file from your computer
Ctrl+U	Open the current page's source code (Not in IE)
F12	Open Developer Tools

APPENDIX B: General Purpose Shortcut Keys for Windows 10

KEY	ACTION
Ctrl + X	Cut the selected item
Ctrl + C (or Ctrl + Insert)	Copy the selected item
Ctrl + V (or Shift + Insert)	Paste the selected item
Ctrl + Z	Undo an action
Alt + Tab	Switch between open apps
Alt + F4	Close the active item, or exit the active app
Windows logo key + L	Lock your PC
Windows logo key + D	Display and hide the desktop
F2	Rename the selected item
F3	Search for a file or folder in File Explorer
F4	Display the address bar list in File Explorer
F5	Refresh the active window
F6	Cycle through screen elements in a window or on the desktop
F10	Activate the Menu bar in the active app
Alt + F8	Show your password on the sign-in screen
Alt + Esc	Cycle through items in the order in which they were opened
Alt + underlined letter	Perform the command for that letter
Alt + Enter	Display properties for the selected item
Alt + Spacebar	Open the shortcut menu for the active window
Alt + Left arrow	Go back
Alt + Right arrow	Go forward
Alt + Page Up	Move up one screen
Alt + Page Down	Move down one screen

Ctrl + F4	Close the active document (in apps that are full-screen and let you have multiple documents open at the same time)
Ctrl + A	Select all items in a document or window
Ctrl + D (or Delete)	Delete the selected item and move it to the Recycle Bin
Ctrl + R (or F5)	Refresh the active window
Ctrl + Y	Redo an action
Ctrl + Right arrow	Move the cursor to the beginning of the next word
Ctrl + Left arrow	Move the cursor to the beginning of the previous word
Ctrl + Down arrow	Move the cursor to the beginning of the next paragraph
Ctrl + Up arrow	Move the cursor to the beginning of the previous paragraph
Ctrl + Alt + Tab	Use the arrow keys to switch between all open apps
Alt + Shift + arrow keys	When a group or tile is in focus on the Start menu, move it in the direction specified
Ctrl + Shift + arrow keys	When a tile is in focus on the Start menu, move it into another tile to create a folder
Ctrl + arrow keys	Resize the Start menu when it's open
Ctrl + arrow key (to move to an item) + Spacebar	Select multiple individual items in a window or on the desktop
Ctrl + Shift with an arrow key	Select a block of text
Ctrl + Esc	Open Start
Ctrl + Shift + Esc	Open Task Manager
Ctrl + Shift	Switch the keyboard layout when multiple keyboard layouts are available
Shift + F10	Display the shortcut menu for the selected item
Shift with any arrow key	Select more than one item in a window or on the desktop, or select text in a document
Shift + Delete	Delete the selected item without moving it to the Recycle Bin first
Right arrow	Open the next menu to the right, or open a submenu
Left arrow	Open the next menu to the left, or close a submenu
Esc	Stop or leave the current task
PrtScn	Take a screenshot of your whole screen and copy it to the clipboard

APPENDIX C: General Purpose Shortcut Keys for UBUNTU 20.04

KEY	ACTION
Alt+F1 or the Super key	Switch between the Activities overview and desktop. In the overview, start typing to instantly search your applications, contacts, and documents.
Alt+F2	Pop up command window (for quickly running commands). Use the arrow keys to quickly access previously run commands.
Super+Tab	Quickly switch between windows. Hold down Shift for reverse order.
Super+ `	Switch between windows from the same application, or from the selected application after Super+Tab. (the ` key is above Tab)

Alt+Esc	Switch between windows in the current workspace. Hold down Shift for reverse order.
Ctrl+Alt+Tab	Give keyboard focus to the top bar. In the Activities overview, switch keyboard focus between the top bar, dash, windows overview, applications list, and search field. Use the arrow keys to navigate.
Super+A	Show the list of applications.
Super+Page Up and Super+Page Down	Switch between workspaces.
Shift+Super+Page Up and Shift+Super+Page Down	Move the current window to a different workspace.
Shift+Super+Left arrow	Move the current window one monitor to the left.
Shift+Super+Right arrow	Move the current window one monitor to the right.
Ctrl+Alt+Delete	Show the Power Off / Restart dialog.
Super+L	Lock the screen.
Super+V	Show the notification list. Press Super+V again or Esc to close.

APPENDIX D: General shortcut keys for OpenOffice.org

KEY	ACTION
Enter key	Activates the focused button in a dialog.
Esc	Terminates the action or dialog. If in OpenOffice.org Help: goes up one level.
Spacebar	Toggles the focused checkbox in a dialog.
Arrow keys	Changes the active control field in an option section of a dialog.
Tab	Advances focus to the next section or element in a dialog.
Shift+Tab	Moves the focus to the previous section or element in a dialog.
Alt+Down Arrow	Opens the list of the control field currently selected in a dialog. This shortcut applies to combo boxes and to icon buttons with pop-up menus. Close an opened list by pressing the Esc key.
Del	Deletes the selected items into the recycle bin.
Shift+Del	Deletes the selected items without putting them in the recycle bin.
Backspace	When a folder is shown: goes up one level (goes back).
Ctrl+Shift+Spacebar	Removes direct formatting from selected text or objects (as in Format > Default Formatting).
Ctrl+Tab	When positioned at the start of a header, a tab is inserted.
Enter (if a drawing object or text object is selected)	Activates text input mode.
Ctrl+O	Opens a document
Ctrl+S	Saves the current document
Ctrl+N	Creates a new document
Shift+Ctrl+N	Opens the Templates and Documents dialog.
Ctrl+P	Prints the document.

Ctrl+Q	Exits the application.
Ctrl+X	Cuts the selected items.
Ctrl+C	Copies the selected items.
Ctrl+V	Pastes from the clipboard.
Ctrl+Shift+V	Opens the Paste Special dialog.
Ctrl+A	Selects all.
Ctrl+Z	Undoes last action.
Ctrl+Y	Redoes last action.
Ctrl+Shift+Y	Repeats last command.
Ctrl+F	Calls the Find & Replace dialog.
Ctrl+Shift+F	Searches for the last entered search term.
Ctrl+Shift+J	Toggles the view between Fullscreen mode and normal mode in Writer or Calc.
Ctrl+Shift+R	Refreshes (redraws) the document view.
Ctrl+Shift+I	Enables or disables the selection cursor in read-only text.
Ctrl+I	Applies the Italic attribute to the selected area or the word in which the cursor is positioned.
Ctrl+B	Applies the Bold attribute to the selected area or the word in which the cursor is positioned.
Ctrl+U	Applies the Underlined attribute to the selected area or the word in which the cursor is positioned.

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[1] C. Hoffman, "47 Keyboard Shortcuts That Work in All Web Browsers," *How-To Geek*. https://www.howtogeek.com/114518/47-keyboard-shortcuts-that-work-in-all-web-browsers/ (accessed Sep. 21, 2021).

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