LABORATORY MANUAL

INTRODUCTION TO IT SYSTEMS

1st/2nd Semester

Diploma in Computer Science & Engineering

C. V. Raman Polytechnic

Bidya Nagar, Mahura, Janla, Bhubaneswar

CONTENTS

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:

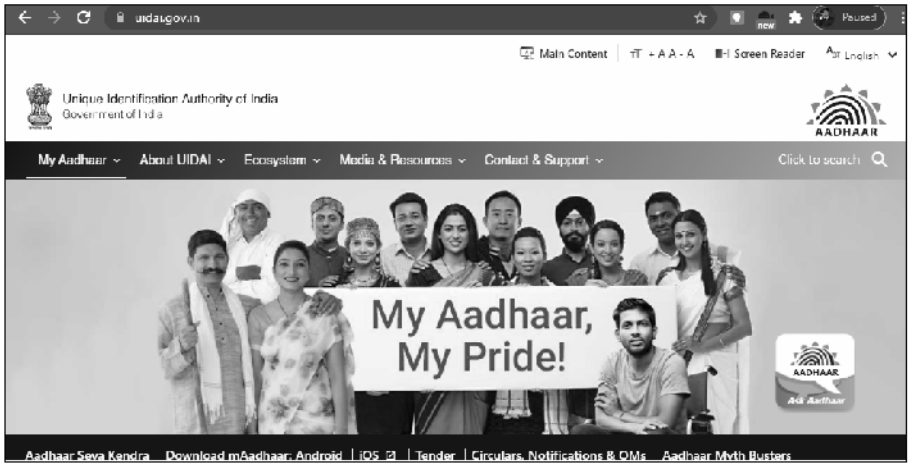

Fig. 1.29: Home Page of UIDAI.GOV.IN Portal

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.

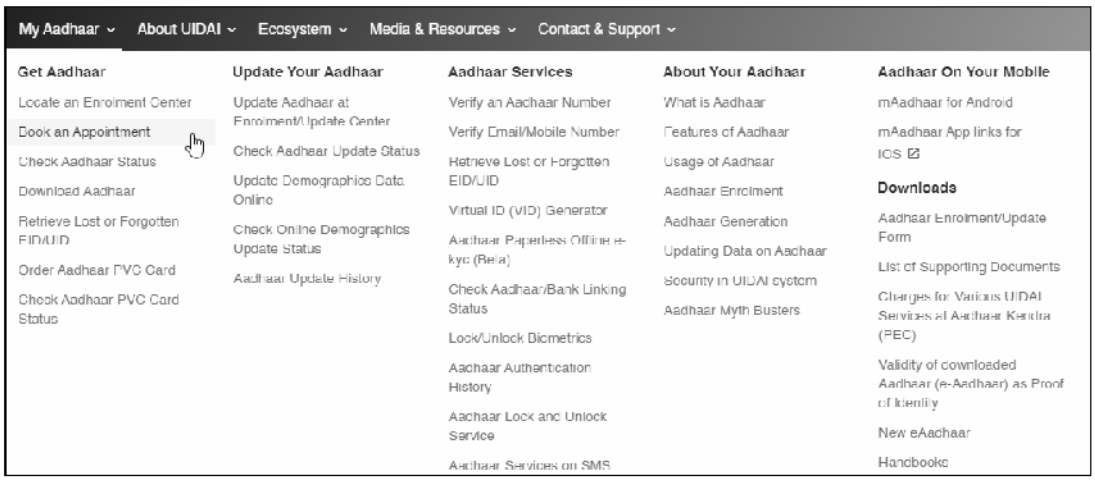

Fig. 1.30: My Aadhaar Menu Showing Various Services

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.

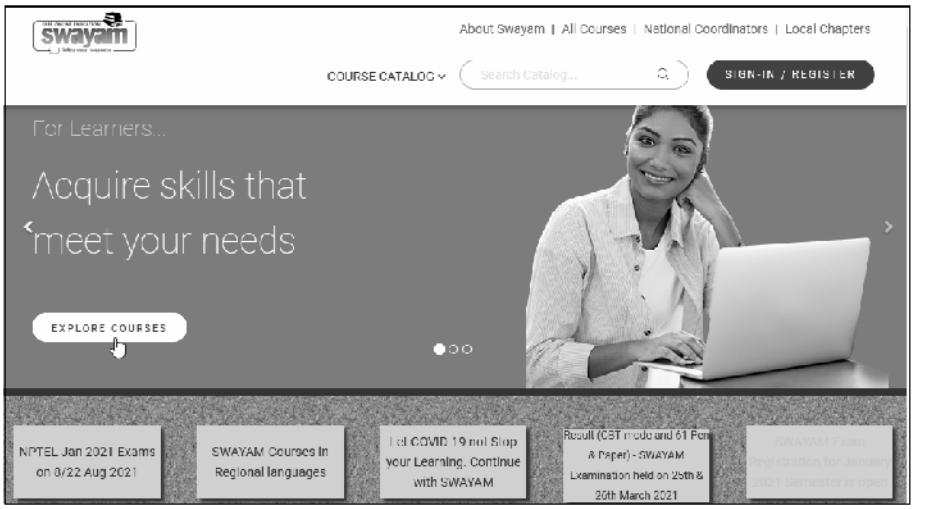

Fig. 1.31: Home Page of Swayam Portal

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.

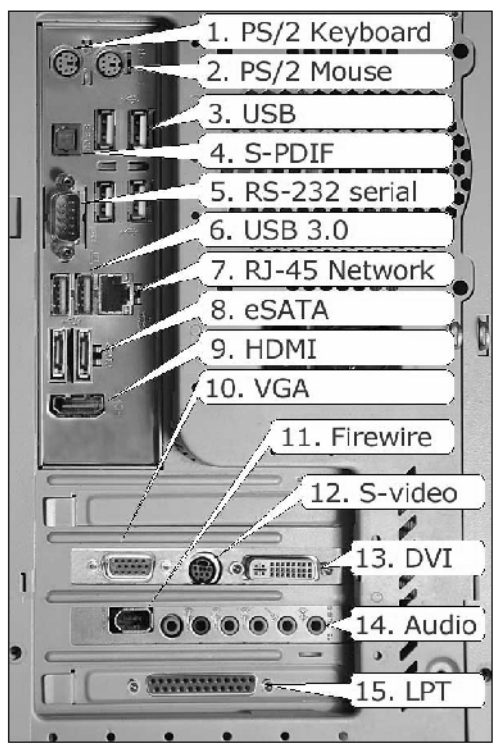

Fig. 1.33: Computer Rear Pannel Connectors
view image source : https://pinouts.ru/comp.php

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.

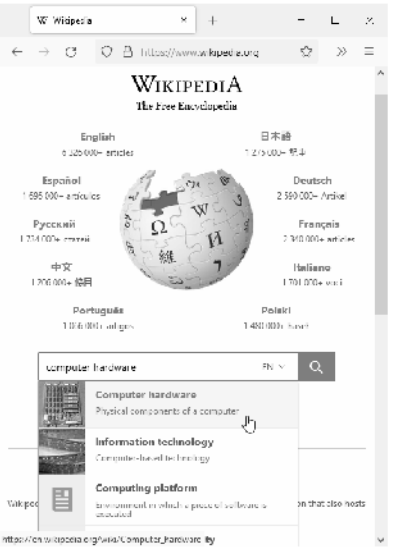

Fig. 1.34: Wikipedia.org Home Page

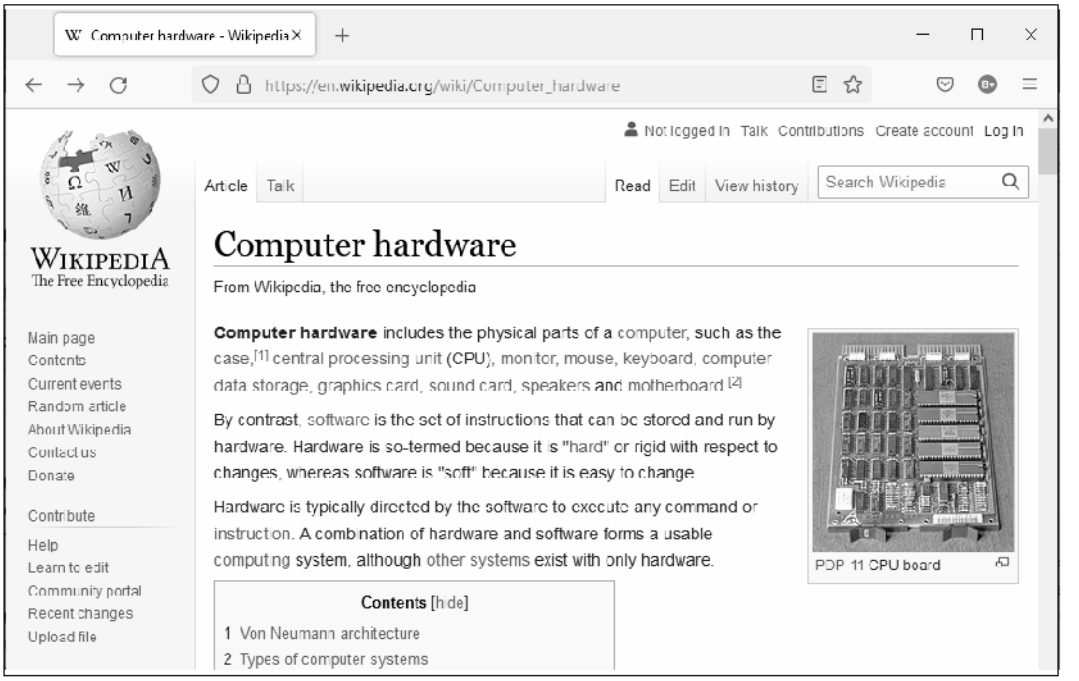

Fig. 1.35: Wikipedia Page on "Computer hardware"

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.

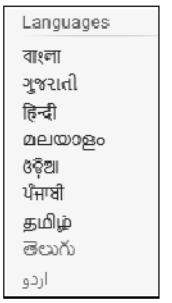

Fig. 1.36: Wikipedia Pages in Other Language

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.

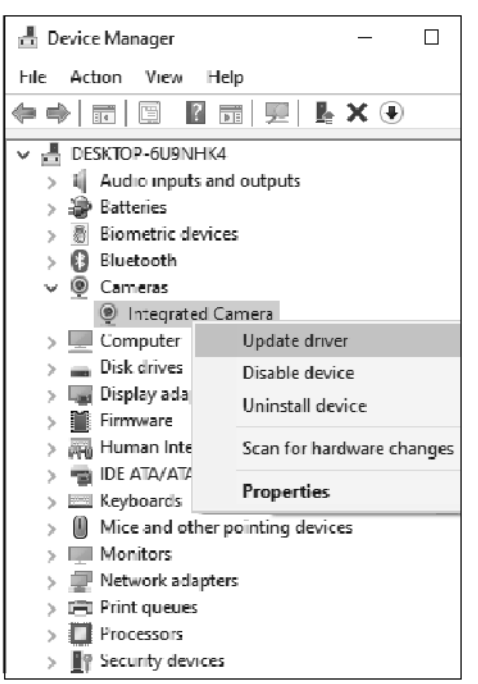

Fig. 1.38: Device Manager Program

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.

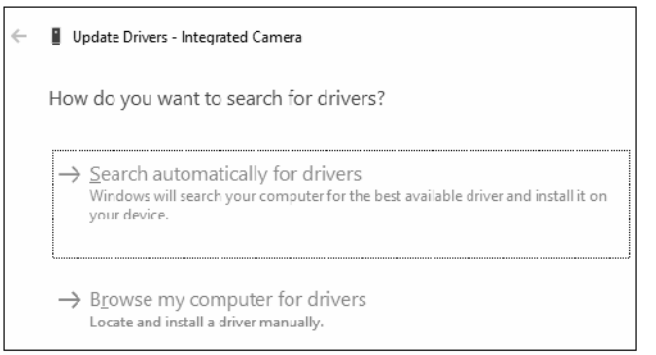

Fig. 1.39: Update Drivers Window

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).

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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.

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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
```

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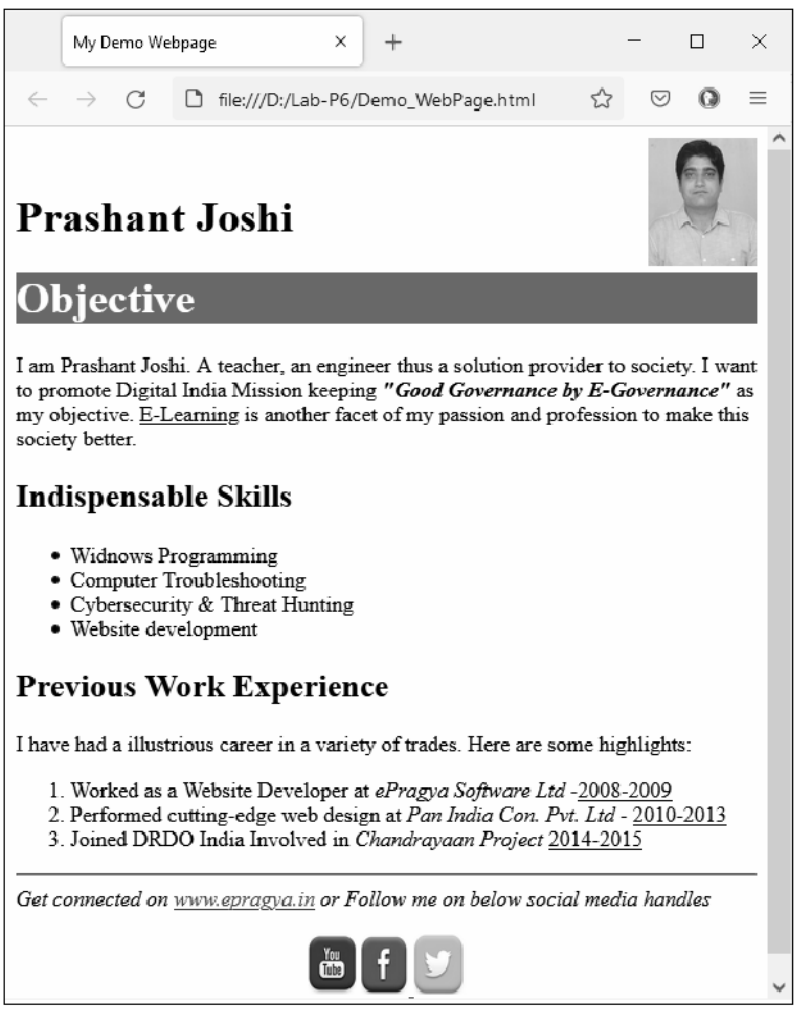
on below social media handles</i>
<p align=center> <a href="https://www.youtube.com/c/ePragya" target="_blank">
<img src="https://drive.google.com/thumbnail?id=1OmCcznYdWRlq5kgBMs8a9eCPclW3P78B"
width="35" height="45"></a>
<a href="https://www.facebook.com/ErPrashantJoshi/" target="_blank">
<img src="https://drive.google.com/thumbnail?id=1BRdjb3m2SbmYyPunQHO83Qtr_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.

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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.

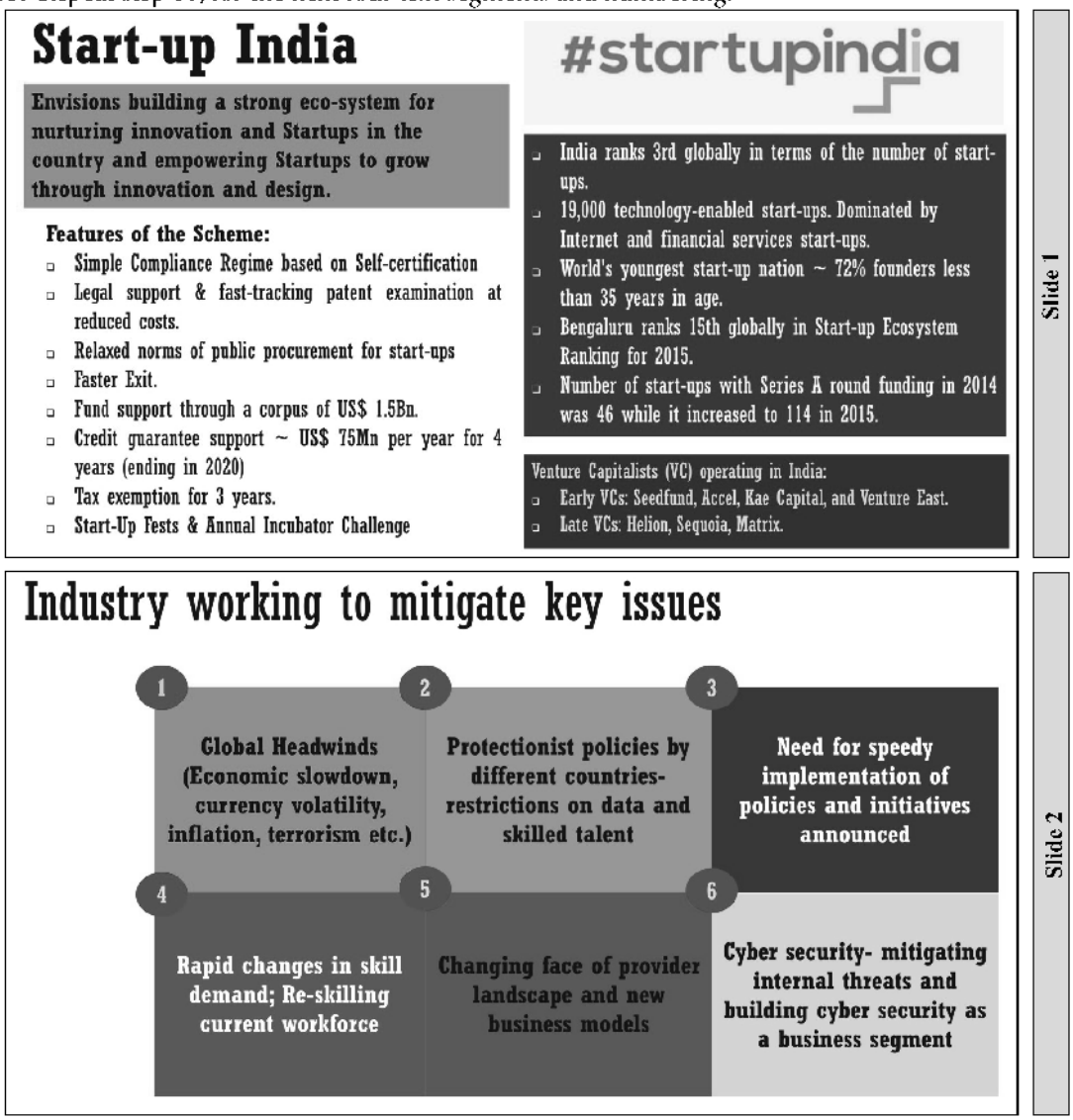

Fig. 4.36: A Template- Presentation Slides

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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- 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.

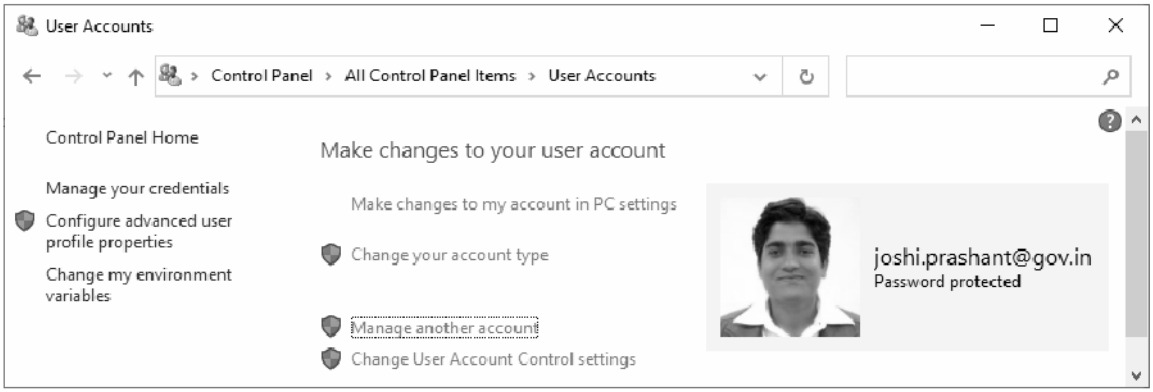

Fig. 5.4: A Standard User Account in Window 10

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".

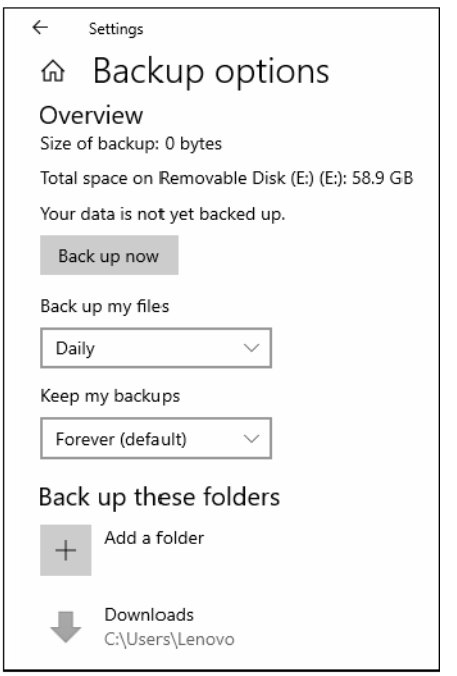

Fig. 5.5: Windows 10 Backup Options

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.

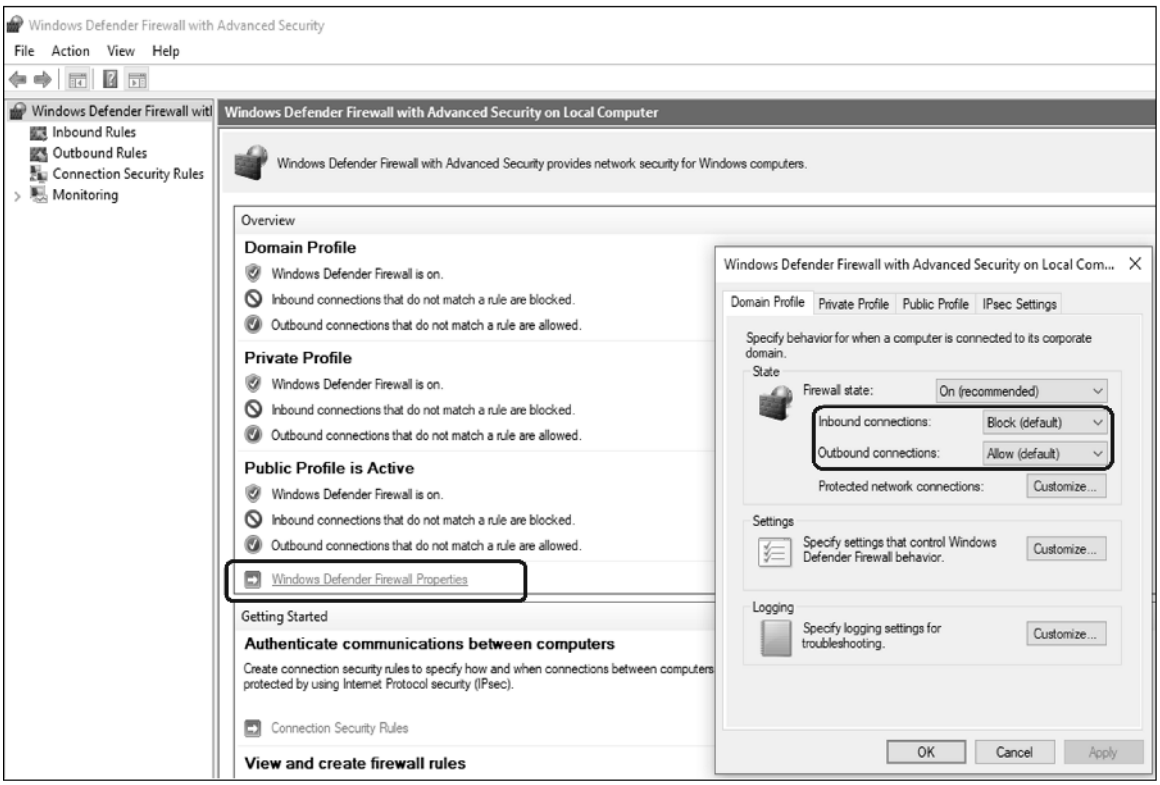

Fig. 5.6: Windows Defender Firewall

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	