Sri Raghavendra Educational Institutions Society(R)

Sri Krishna Institute of Technology

(Accredited by NAAC Approved by A.I.C.T.E. New Delhi, Recognized by Govt. of Karnataka
Affiliated to V.T U., Belagavi)
#57, Chimney Hills, Hesaraghatta Main Road, Chikkabanavara Post, Bangalore- 560090

LABORATORY MANUAL

Technical Writing using Latex

[BCS456D]

Prepared by: Kavya M
Dept of: CSE

Name of the Student:	
USN:	
Branch/Semester:	
Academic Year:	

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GENERAL INSTRUCTIONS

Do's

1. Write clear and concise code with meaningful variable and method names.
2. Test your code thoroughly with different inputs to ensure correctness.
3. Comment your code to explain complex logic and improve readability.
4. Use an IDE to write, compile, and run your C programs efficiently.
5. Ask for help if you're stuck, but ensure you understand the solution.
6. Approach problems methodically, breaking them into smaller tasks.
7. Maintain observation book.
8. Neatly write your record and submit it for each lab.
9. Wear Proper Lab Attire and leave your foot wares neatly outside.
10. Entry the information in login registers while entering and leaving the lab.
11. Only use your assigned Computer.
12. While leaving the lab shut down your system and keep the chairs properly.

Dont's

1. Don't Change the Settings.
2. Do not eat or drink in the laboratory.
3. Avoid stepping on electrical wires or any other computer cables.
4. Do not insert metal objects such as clips, pins and needles into the computer casings. They may cause fire.
5. Do not remove anything from the computer laboratory without permission.
6. Do not touch, connect or disconnect any plug or cable without your lecturer/laboratory technician's permission.
7. Do not misbehave in the computer laboratory and obey the respective lab in charge.

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<table>
<tr><th>Sl. No.</th><th>Name of the Experiment</th></tr>
<tr><td>1.</td><td>Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.</td></tr>
<tr><td>2.</td><td>Develop a LaTeX script to create a document that displays the sample Abstract/Summary</td></tr>
<tr><td>3.</td><td>Develop a LaTeX script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]</td></tr>
<tr><td>4.</td><td>Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]</td></tr>
<tr><td>5.</td><td>Develop a LaTeX script to create a document that contains the following table with proper labels.
<table>
<tr><th rowspan="2">S.No</th><th rowspan="2">USN</th><th rowspan="2">Student Name</th><th colspan="3">Marks</th></tr>
<tr><th>Subject1</th><th>Subject2</th><th>Subject3</th></tr>
<tr><td>1</td><td>4XX22XX001</td><td>Name 1</td><td>89</td><td>60</td><td>90</td></tr>
<tr><td>2</td><td>4XX22XX002</td><td>Name 2</td><td>78</td><td>45</td><td>98</td></tr>
<tr><td>3</td><td>4XX22XX003</td><td>Name 3</td><td>67</td><td>55</td><td>59</td></tr>
</table></td></tr>
<tr><td>6.</td><td>Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the subgraph concept</td></tr>
<tr><td>7.</td><td>Develop a LaTeX script to create a document that consists of the following two mathematical equations
$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$
$$= \frac{-2 \pm \sqrt{2^2-4*(1)*(-8)}}{2*1}$$
$$= \frac{-2 \pm \sqrt{4+32}}{2}$$
$$\varphi_\sigma^\lambda A_t = \sum_{\pi \in C_t} \operatorname{sgn}(\pi)\varphi_\sigma^\lambda \varphi_\pi^\lambda$$
$$= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\sigma^{-1}\tau\sigma)\varphi_\sigma^\lambda \varphi_{\sigma^{-1}\tau\sigma}^\lambda$$
$$= A_{\sigma t}\varphi_\sigma^\lambda$$</td></tr>
<tr><td>8.</td><td>Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document</td></tr>
<tr><td>9.</td><td>Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section</td></tr>
</table>

10.	Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library
11.	Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library

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Department of Computer Science and Engineering

Vision

"To be in the frontier of Computer Science & Engineering and to create technically competent graduates with ethical, moral values committed to meet Industry and Societal needs."

Mission

1. To produce ethical, motivated, and skilled engineers through theoretical knowledge and practical applications.
2. Inculcate problem solving and team building skills and promote lifelong learning with a sense of societal responsibilities.
3. To facilitate functional ambience for research, consultancy and entrepreneurship

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Program Outcomes	
PO1	**Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis: Identify,** formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
PO3	**Design/ Development of Solutions**: Design solutions for complex engineeringproblems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societaland environmental considerations.
PO4	**Conduct investigations of complex problems** using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	**Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to Complex engineering activities with an under- standing of the limitations.
PO6	**The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and theConsequent responsibilities relevant to professional engineering practice.
PO7	**Environment and Sustainability**: Understand the impact of professionalEngineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics andResponsibilities and norms of engineering practice.
PO9	**Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO11	**Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.
PO12	**Project Management and** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in Multi-disciplinary environments.
Program Specific Outcomes	
m.	**PSO1:** Model computational problems by applying mathematical concepts and design solutions using suitable data structures & algorithmic techniques
n.	**PSO2:** Demonstrate basic knowledge of computer science in efficient design of problem solutions of varying complexity
o.	**PSO3:** Create career path to become a successful computer science professional, entrepreneur and relish for higher studies.

LATEX Installation

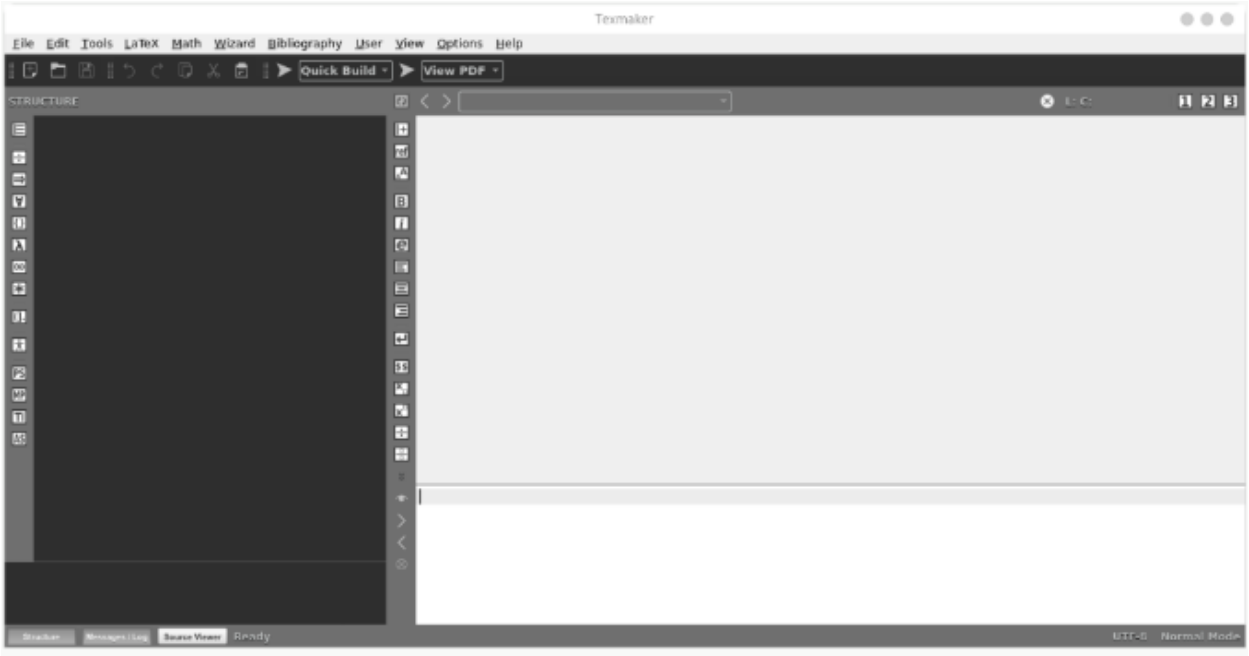
- To install the LaTeX typesetting system on Ubuntu 22.04 systems, run the following command which installs all the packages required.

```
$ sudo apt install texlive-full
```

- Next we will install the LaTeX editor. There are several editors available but Texmaker is the best in my opinion. You can again install it via the following command.

```
$ sudo apt install texmaker
```

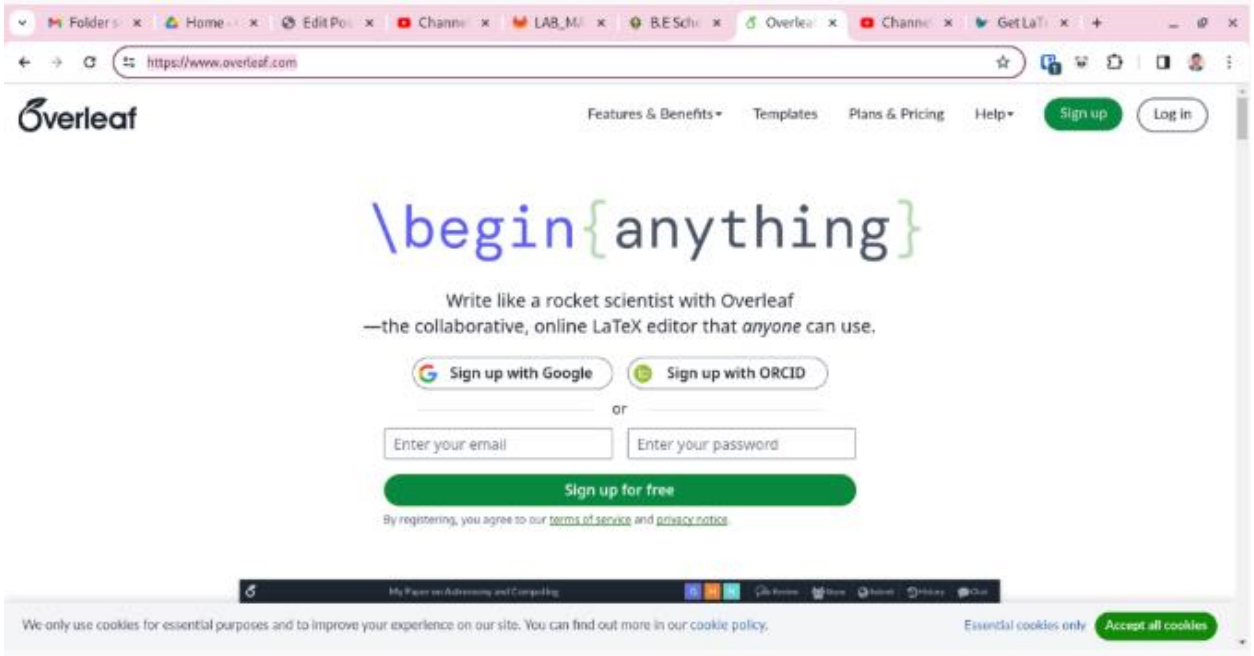
- This is how the TexMaker editor looks after launching it.



- For Windows and other systems, you can get LaTeX editing environment set up by referring to this page.

https://www.latex-project.org/get

- If you want to run latex from your browser, you can create a account on **Overleaf** and run these solutions online in your browser.


https://www.overleaf.com
Overleaf
Features & Benefits
Templates
Plans & Pricing
Help
Sign up
Log in
\begin{anything}
Write like a rocket scientist with Overleaf
—the collaborative, online LaTeX editor that anyone can use.
Sign up with Google
Sign up with ORCID
or
Enter your email
Enter your password
Sign up for free
By registering, you agree to our terms of service and privacy notice
We only use cookies for essential purposes and to improve your experience on our site. You can find out more in our cookie policy.
Essential cookies only
Accept all cookies

Question 1

Simple Document

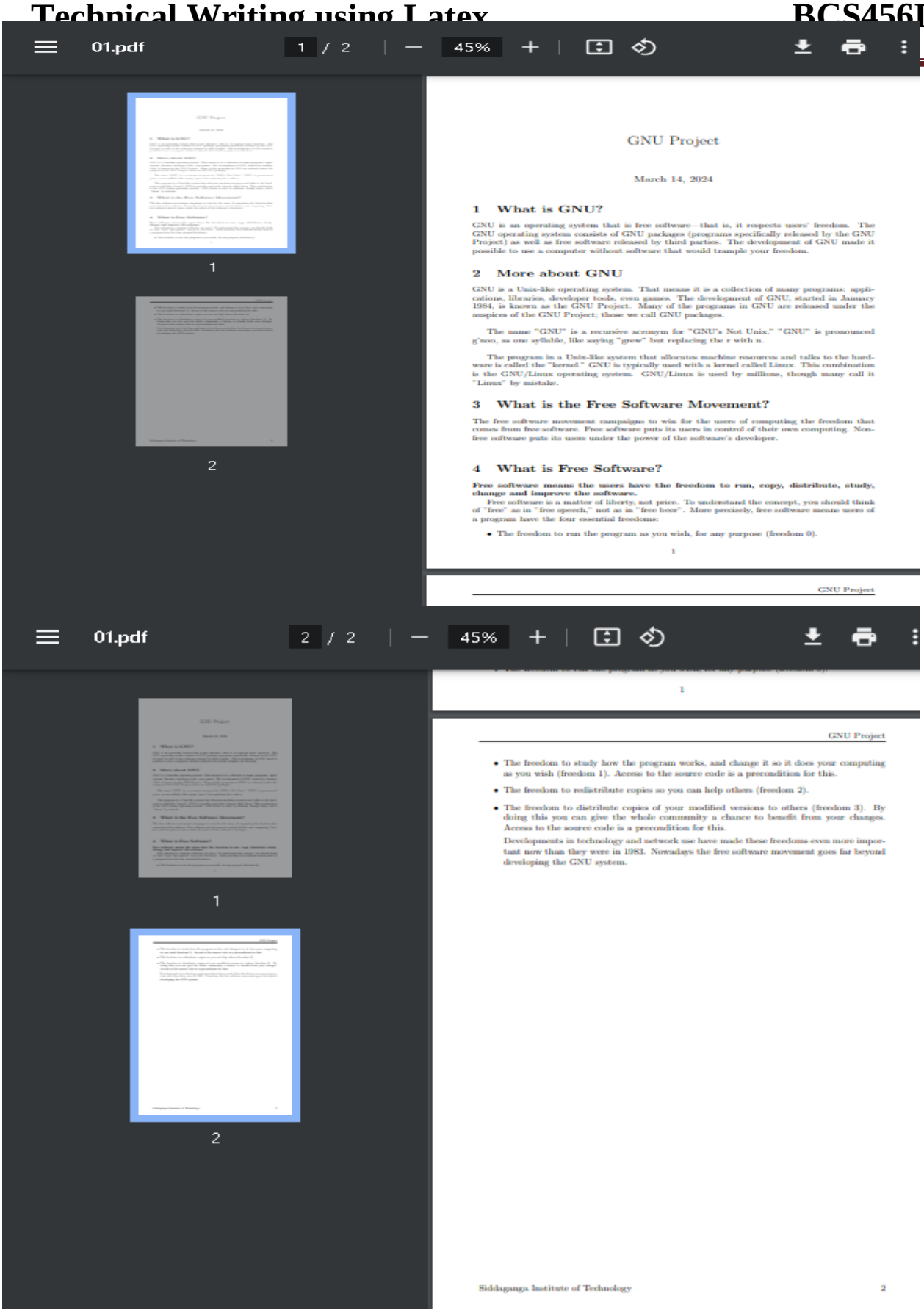
Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.

Latex Code

```
\documentclass[12pt,a4paper]{article}
\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}
\usepackage{fancyhdr}
\begin{document}
% Set the page style to "fancy"...
\pagestyle{fancy}
\title{GNU Project}

\fancyhf{} % clear existing header/footer entries
% We don't need to specify the O coordinate
\fancyhead{} % clear all header fields
\fancyhead[R]{GNU Project}
\fancyfoot{}  % clear all footer fields
\fancyfoot[LO,CE]{Siddaganga Institute of Technology}

\fancyfoot[R]{\thepage}
\maketitle

\section{What is GNU?}
GNU is an operating system that is free software—that is, it respects users' freedom. The GNU operating system consists of GNU packages (programs specifically released by the GNU Project) as well as free software released by third parties. The development of GNU made it possible to use a computer without software that would trample your freedom.

\section{More about GNU}
GNU is a Unix-like operating system. That means it is a collection of many programs: applications, libraries, developer tools, even games. The development of GNU, started in January 1984, is known as the GNU Project. Many of the programs in GNU are released under the auspices of the GNU Project; those we call GNU packages. \\

The name "GNU" is a recursive acronym for "GNU's Not Unix." "GNU" is pronounced g'noo, as one syllable, like saying "grew" but replacing the r with n. \\

The program in a Unix-like system that allocates machine resources and talks to the hardware is called the "kernel." GNU is typically used with a kernel called Linux. This combination is the GNU/Linux operating system. GNU/Linux is used by millions, though many call it "Linux" by mistake.

\section{What is the Free Software Movement?}
The free software movement campaigns to win for the users of computing the freedom that comes
```

```
from free software. Free software puts its users in control of their own computing. Nonfree software puts its users under the power of the software's developer. \\

\section{What is Free Software?}
\textbf{Free software means the users have the freedom to run, copy, distribute, study, change and improve the software.}

Free software is a matter of liberty, not price. To understand the concept, you should think of "free" as in "free speech," not as in "free beer". More precisely, free software means users of a program have the four essential freedoms:

\begin{itemize}
\item The freedom to run the program as you wish, for any purpose (freedom 0).
\item The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
\item The freedom to redistribute copies so you can help others (freedom 2).
\item The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Developments in technology and network use have made these freedoms even more important now than they were in 1983. Nowadays the free software movement goes far beyond developing the GNU system.

\end{itemize}


\end{document}
```

Output


01.pdf
1 / 2
45%
1
2
GNU Project
March 14, 2024
1 What is GNU?
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2 More about GNU
GNU is a Unix-like operating system. That means it is a collection of many programs: applications, libraries, developer tools, even games. The development of GNU, started in January 1984, is known as the GNU Project. Many of the programs in GNU are released under the auspices of the GNU Project; those we call GNU packages.
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3 What is the Free Software Movement?
The free software movement campaigns to win for the users of computing the freedom that comes from free software. Free software puts its users in control of their own computing. Non-free software puts its users under the power of the software's developer.
4 What is Free Software?
Free software means the users have the freedom to run, copy, distribute, study, change and improve the software.
Free software is a matter of liberty, not price. To understand the concept, you should think of "free" as in "free speech," not as in "free beer". More precisely, free software means users of a program have the four essential freedoms:
• The freedom to run the program as you wish, for any purpose (freedom 0).
1
GNU Project
01.pdf
2 / 2
45%
1
2
GNU Project
• The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
• The freedom to redistribute copies so you can help others (freedom 2).
• The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.
Developments in technology and network use have made these freedoms even more important now than they were in 1983. Nowadays the free software movement goes far beyond developing the GNU system.
Siddaganga Institute of Technology
2

Question 2

Abstract/Summary

Develop a Latex script to create a document that displays the sample Abstract/Summary

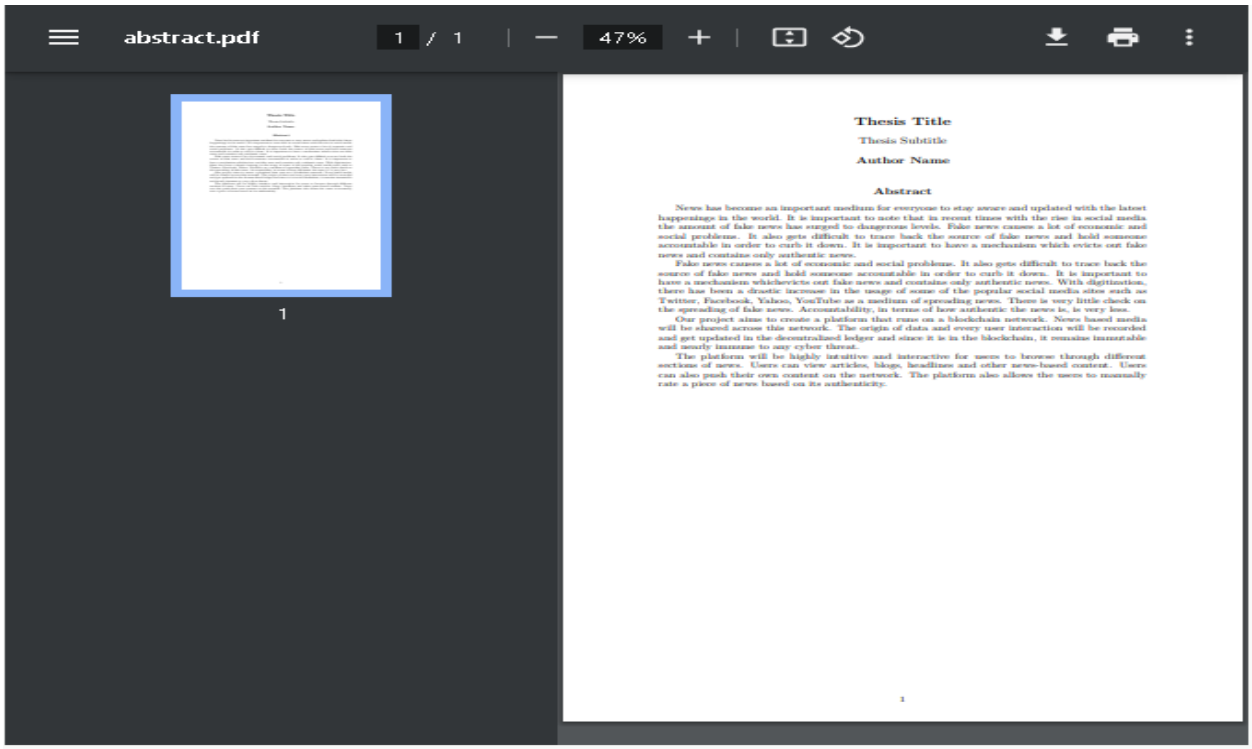
Latex Code

```
\documentclass[10pt,a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage[left=3cm,right=3cm,top=2cm,bottom=2cm]{geometry}
%\usepackage{lipsum}

\begin{document}
\thispagestyle{plain}

\begin{center}
    \Large
    \textbf{Thesis Title}

    \vspace{0.4cm}
    \large
    Thesis Subtitle

    \vspace{0.4cm}
    \textbf{Author Name}

    \vspace{0.9cm}
    \textbf{Abstract}
\end{center}
%\lipsum[1]

News has become an important medium for everyone to stay aware and updated with the latest
happenings in the world. It is important to note that in recent times with the rise in social media the
amount of fake news has surged to dangerous levels. Fake news causes a lot of economic and social
problems. It also gets difficult to trace back the source of fake news and hold someone accountable in
order to curb it down. It is important to have a mechanism which evicts out fake news and contains
only authentic news.

Fake news causes a lot of economic and social problems. It also gets difficult to trace back the source
of fake news and hold someone accountable in order to curb it down. It is important to have a
mechanism whichevicts out fake news and contains only authentic news. With digitization, there has
been a drastic increase in the usage of some of the popular social media sites such as Twitter,
Facebook, Yahoo, YouTube as a medium of spreading news. There is very little check on the
spreading of fake news. Accountability, in terms of how authentic the news is, is very less.

Our project aims to create a platform that runs on a blockchain network. News based media will be
shared across this network. The origin of data and every user interaction will be recorded and get
```

updated in the decentralized ledger and since it is in the blockchain, it remains immutable and nearly immune to any cyber threat.

The platform will be highly intuitive and interactive for users to browse through different sections of news. Users can view articles, blogs, headlines and other news-based content. Users can also push their own content on the network. The platform also allows the users to manually rate a piece of news based on its authenticity.
\end{document}

Output



Question 3

Title page of the VTU Project Report
Develop a Latex script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]

Latex Code

Take the photo of VTU logo and create the Latex program save with extension called filename.tex and also save the logo image to same location.

```
\documentclass{report}
\usepackage{graphicx}
\usepackage{geometry}

% adjust margins if needed
\geometry{left=1in, right=1in, top=1in, bottom=1in}

\begin{document}

\begin{titlepage}
\begin{center}
{\Huge \textbf {Visvesvaraya Technological University}}\\
\centering Belagavi-560091\\
\vspace{1cm}
\includegraphics[width=0.4\textwidth]{img.jpg} % Replace vtulogo.png with the actual VTU logo file name
\vspace{1cm}
\Huge \centering{A}\\
\Huge \textbf{Project Report}\\
\centering{on}
\vspace{0.5cm}
\Large {Soft Computing}
\vspace{0.5cm}
\Large {Submitted by}
\vspace{0.5cm}
{\large YOUR NAME (1KTCS000)}
\vspace{1.0cm}
{\Large Under the guidance of}
\vspace{0.3cm}
{\Large Prof. Kavya M }\\
\centering{Assistant Professor}\\
\centering{Dept of CSE}
% \vfill
{\large \today}
\end{center}
\end{titlepage}

\end{document}
```

OUTPUT

Visvesvaraya Technological University

Belagavi-560091

A

Project Report

on

Soft Computing

Submitted by

YOUR NAME (1KTCS000)

Under the guidance of

Prof. Kavya M
Assistant Professor
Dept of CSE

June 25, 2024

Question 4

Develop a Latex script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]

Latex Code

```
\documentclass{article}
\begin{document}
\begin{titlepage}
\centering
\vspace*{2cm}
{\LARGE \textbf{CERTIFICATE}\par}
\vspace{1cm}
This is to certify that\par
\vspace{0.5cm}
\underline{\hspace{8cm}}\par % Space for Name
\vspace{0.5cm}
has successfully completed the project work entitled\par
\vspace{0.5cm}
\underline{\hspace{8cm}}\par % Space for Project Title
\vspace{0.5cm}
under our guidance and supervision.\par
\vspace{1cm}
\begin{flushright}
\underline{\hspace{5cm}}\\ % Space for Guide/Supervisor Name
Guide/Supervisor\\
\vspace{1cm}
\underline{\hspace{5cm}}\\ % Space for Department Head Name
Head of the Department\\
\end{flushright}
\vfill
\centering
\rule{0.8\textwidth}{0.4pt}\\ % Horizontal line
Date: \underline{\hspace{4cm}} % Space for Date
\end{titlepage}

\end{document}
```

Output

CERTIFICATE

This is to certify that

_____

has successfully completed the project work entitled

_____

under our guidance and supervision.

_____.
Guide/Supervisor

_____.
Head of the Department

_____.
Date: _____

Question 5

Develop a Latex script to create a document that contains the following table with proper labels.

Table Demo

Marks Table

S.No	USN	Student Name	Marks		
			Subject1	Subject2	Subject3
1	4XX22XX001	Name 1	88	77	97
2	4XX22XX002	Name 2	74	78	66
3	4XX22XX003	Name 3	88	82	79

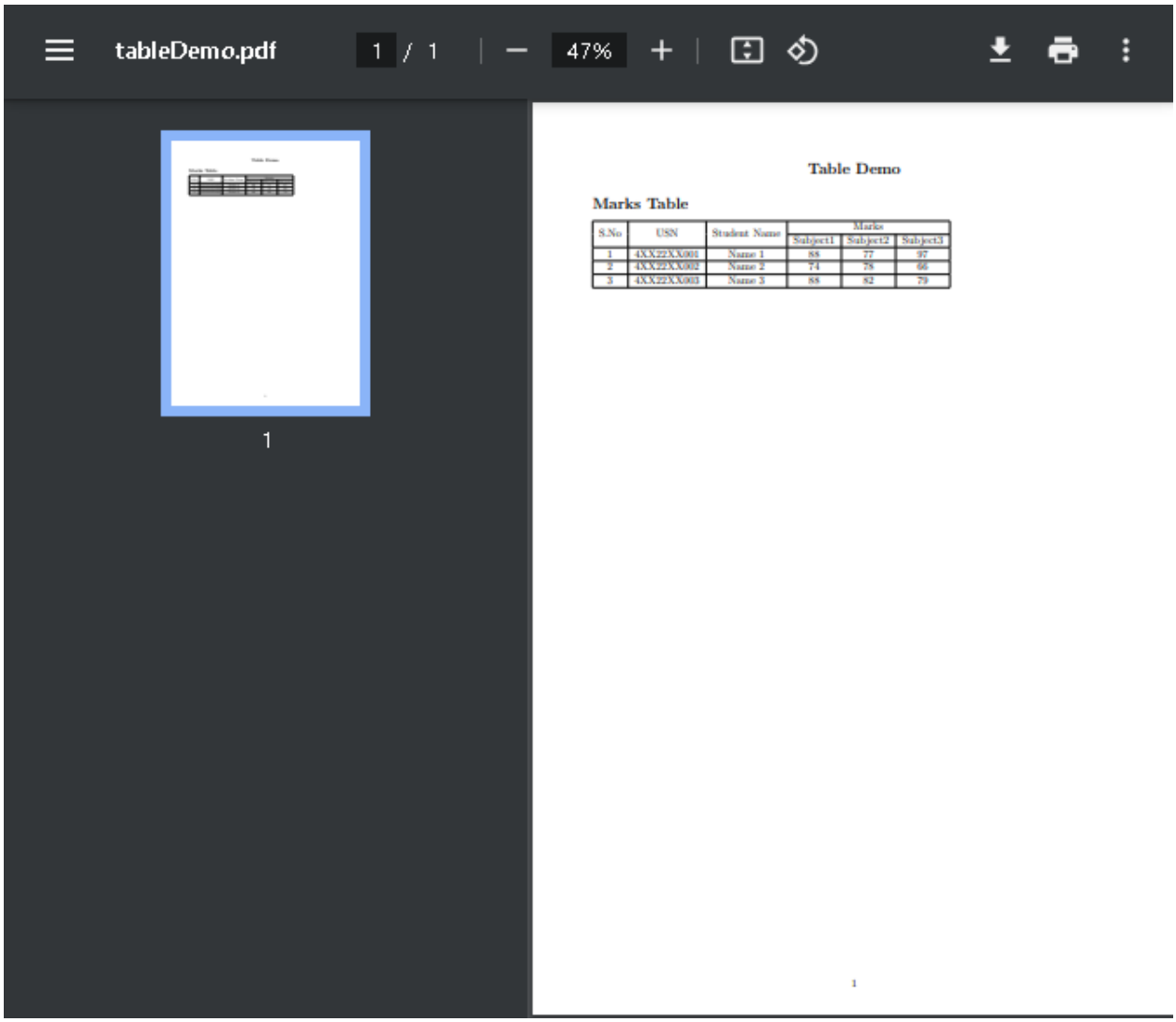
Latex Code

```
\documentclass[10pt,a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}
\usepackage{multirow}
\begin{document}

\begin{center}
\begin{Large}
\textbf{Table Demo}
\end{Large}
\end{center}

\section*{Marks Table}

\begin{tabular}{|c|c|c|c|c|c|}
\hline
\multirow{2}{*}{S.No} & \multirow{2}{*}{USN} & \multirow{2}{*}{Student Name} &
   \multicolumn{3}{c|}{Marks} \\
\cline{4-6}
 &  &  & Subject1 & Subject2 & Subject3 \\
    \hline
    1 & 4XX22XX001 & Name 1 & 88 & 77 & 97 \\
    \hline
    2 & 4XX22XX002 & Name 2 & 74 & 78 & 66 \\
    \hline
    3 & 4XX22XX003 & Name 3 & 88 & 82 & 79 \\
    \hline
```

\end{tabular}

\end{document}

Output



]

Question 6

Subgraph Concept

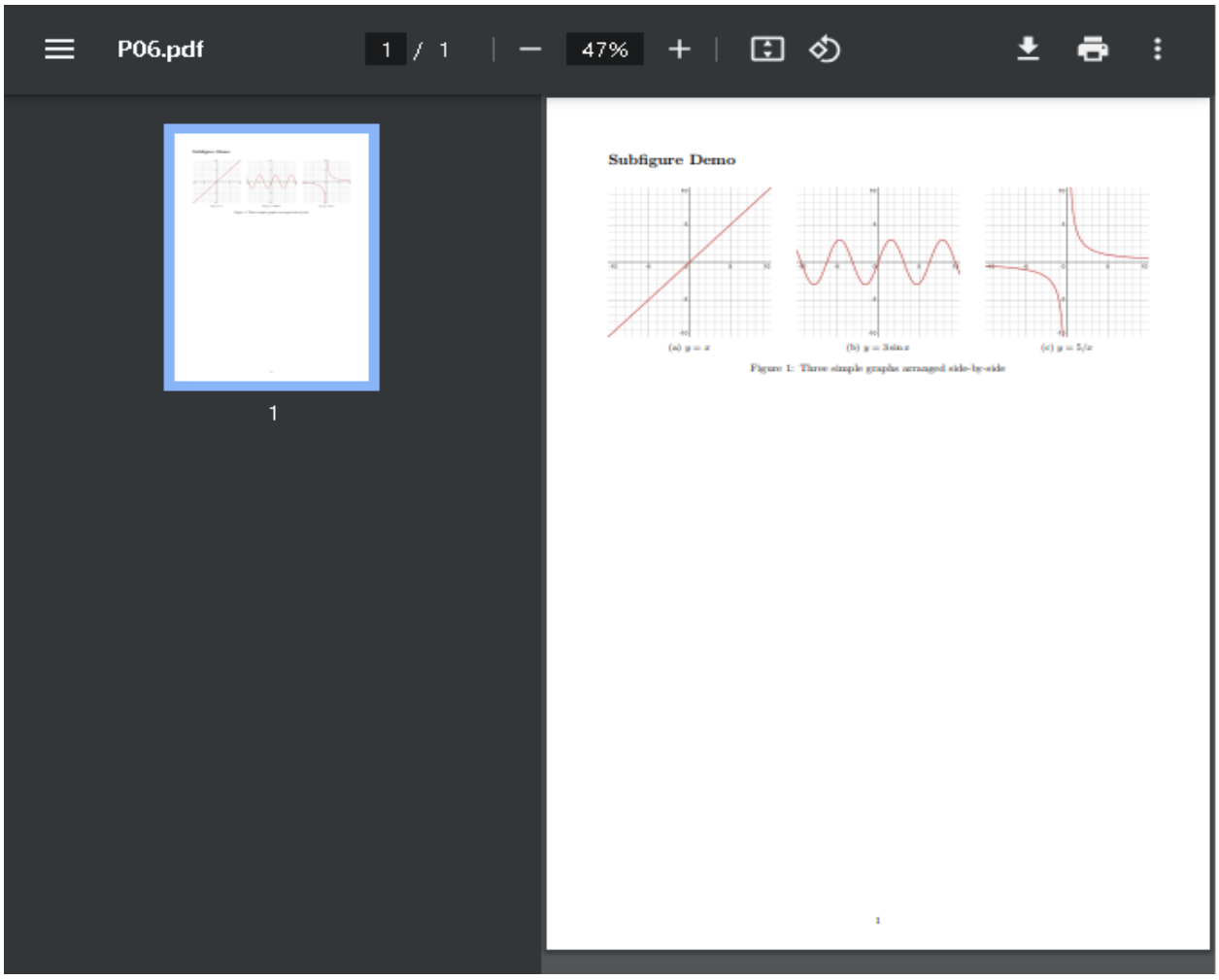
Develop a Latex script to include the side-by-side graphics/pictures/figures in the document by using the sub graph concept.

Latex Code

```
\documentclass[10pt,a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{caption}
\usepackage{subcaption}
\usepackage{graphicx}
\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}
\begin{document}

\section*{Subfigure Demo}


\begin{figure}[h]
    \centering
    \begin{subfigure}[b]{0.3\textwidth}
        \centering
        \includegraphics[width=\textwidth]{graph1.png}
        \caption{$y=x$}
        \label{fig:y equals x}
    \end{subfigure}
    \hfill
    \begin{subfigure}[b]{0.3\textwidth}
        \centering
        \includegraphics[width=\textwidth]{graph2.png}
        \caption{$y=3\sin x$}
        \label{fig:three sin x}
    \end{subfigure}
    \hfill
```

```
    \begin{subfigure}[b]{0.3\textwidth}
        \centering
        \includegraphics[width=\textwidth]{graph3.png}
        \caption{$y=5/x$}
        \label{fig:five over x}
    \end{subfigure}
    \caption{Three simple graphs arranged side-by-side}
    \label{fig:three graphs}
\end{figure}

\end{document}
```

Output



Question 7

Mathematical Equations in Latex

Develop a Latex script to create a document that consists of the following two mathematical equations

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$
$$= \frac{-2 \pm \sqrt{2^2-4*(1)*(-8)}}{2*1}$$
$$= \frac{-2 \pm \sqrt{4+32}}{2}$$

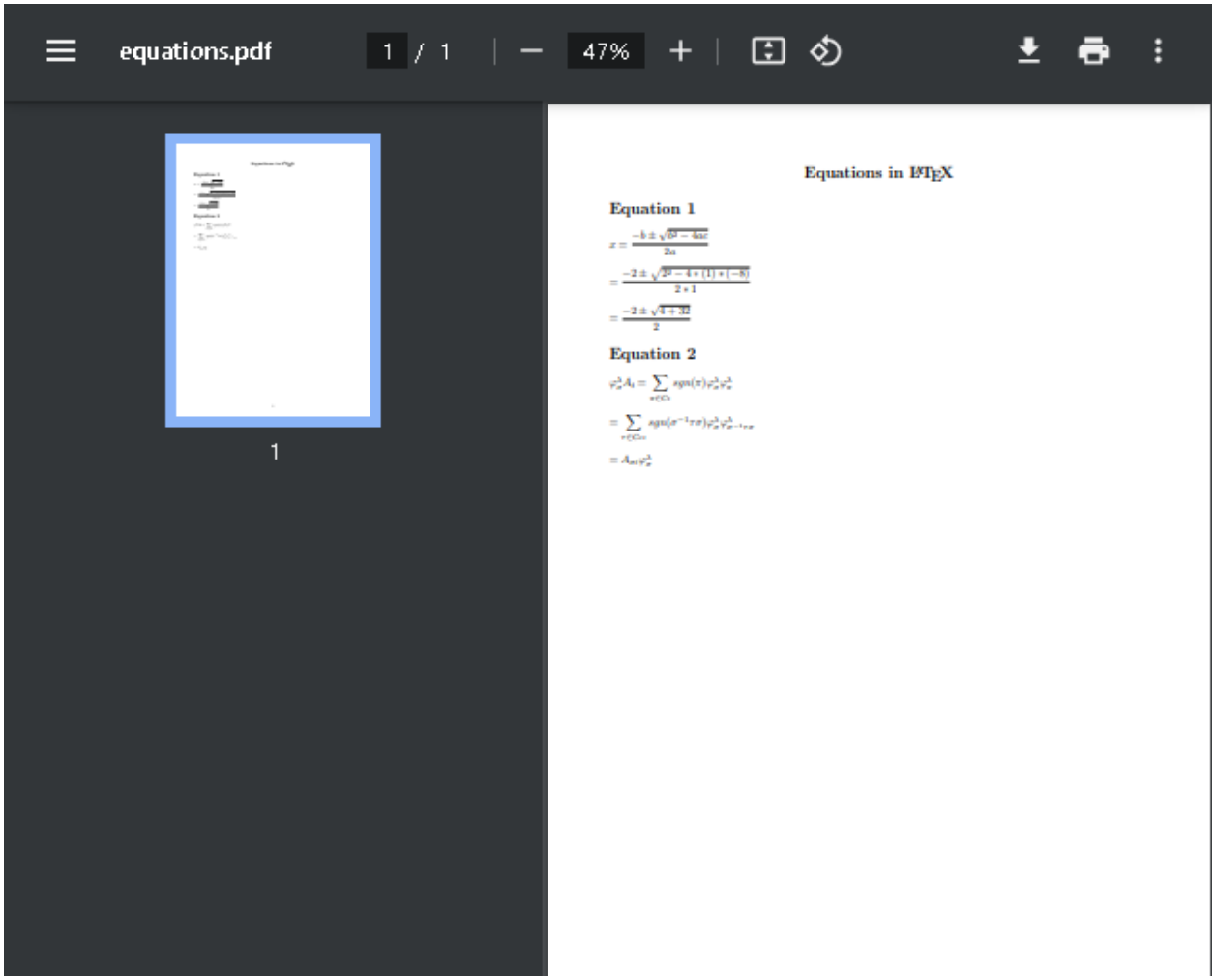
$$\varphi_\sigma^\lambda A_t = \sum_{\pi \in C_t} \operatorname{sgn}(\pi) \varphi_\sigma^\lambda \varphi_\pi^\lambda$$
$$= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\sigma^{-1}\tau\sigma) \varphi_\sigma^\lambda \varphi_{\sigma^{-1}\tau\sigma}^\lambda$$
$$= A_{\sigma t} \varphi_\sigma^\lambda$$

Latex Code

```
\documentclass[10pt,a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath,nccmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}
\begin{document}

\begin{center}
\Large{\textbf{Equations in \LaTeX}}
\end{center}

\section*{Equation 1}

%\begin{eqnarray}
%x = \frac{-b \pm \sqrt{b^{2}-4ac}}{2a} \\
%= \frac{-2 \pm \sqrt{2^{2}-4*(1)*(-8)}}{2*1}
%\end{eqnarray}

\begin{fleqn}
```

```
\[
x = \frac{-b \pm \sqrt{b^{2}-4ac}}{2a}
\]



\[
= \frac{-2 \pm \sqrt{2^{2}-4*(1)*(-8)}}{2*1}
\]

\[
= \frac{-2 \pm \sqrt{4+32}}{2}
\]
\end{fleqn}


\section*{Equation 2}

\begin{fleqn}
\[
\varphi^{\lambda}_{\sigma}A_{t} = \sum_{\pi \in C_{t}}
    sgn(\pi)\varphi^{\lambda}_{\sigma}\varphi^{\lambda}_{\pi}
\]

\[
= \sum_{\tau \in C_{\sigma t}} sgn(\sigma^{-
    1}\tau\sigma)\varphi^{\lambda}_{\sigma}\varphi^{\lambda}_{\sigma^{-1}\tau\sigma}
\]

\[
= A_{\sigma t} \varphi^{\lambda}_{\sigma}
\]

\end{fleqn}
\end{document}
```

Output


equations.pdf
1 / 1
47%
1
Equations in LaTeX
Equation 1
Equation 2

Question 8

Numbered theorems, definitions, corollaries and lemmas

Develop a Latex script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document.

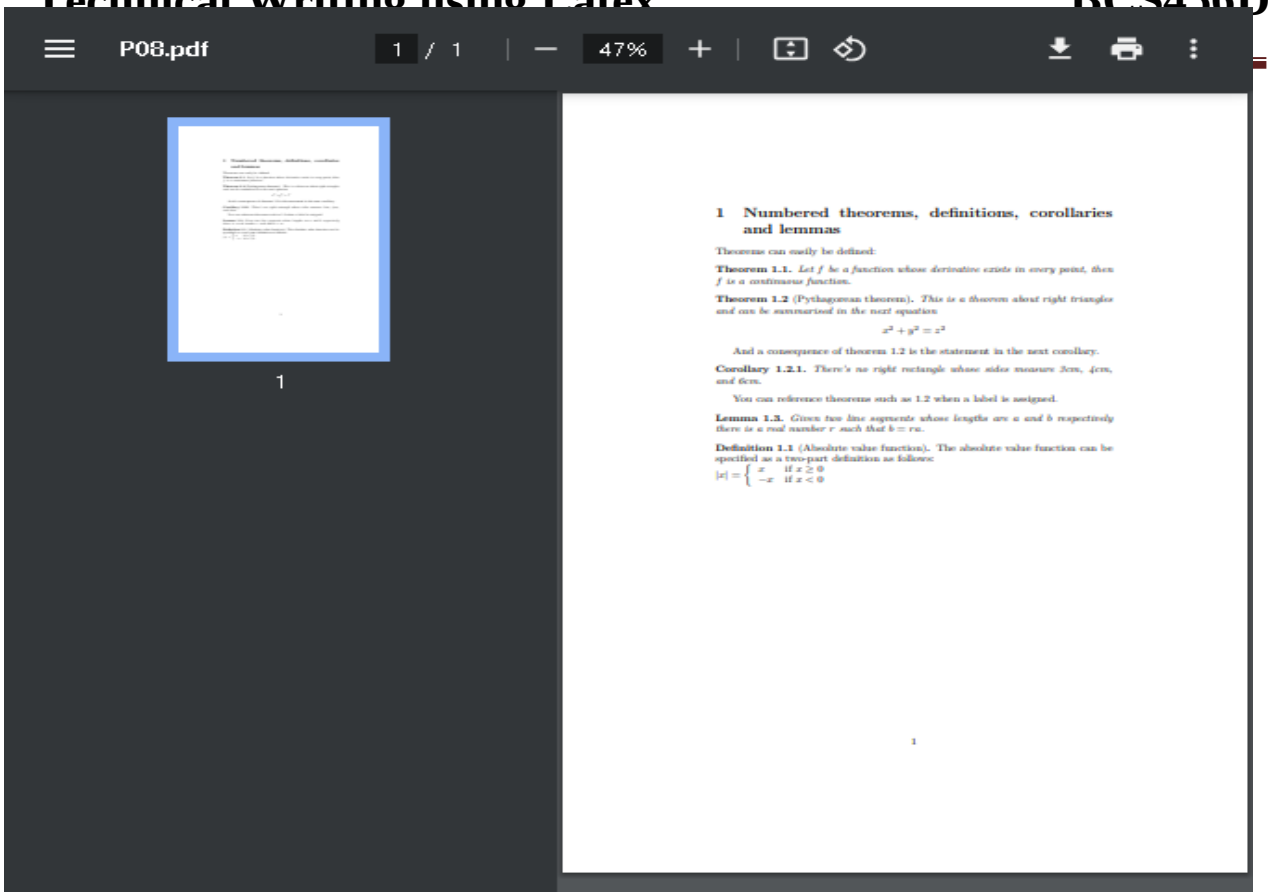
Latex Code

```
\documentclass{article}
\usepackage[english]{babel}
\usepackage{amsthm}

\newtheorem{theorem}{Theorem}[section]
\newtheorem{corollary}{Corollary}[theorem]
\newtheorem{lemma}[theorem]{Lemma}

\theoremstyle{definition}
\newtheorem{definition}{Definition}[section]

\begin{document}
\section{Numbered theorems, definitions, corollaries and lemmas}
Theorems can easily be defined:

\begin{theorem}
Let \(f\) be a function whose derivative exists in every point, then \(f\) is
a continuous function.
\end{theorem}

\begin{theorem}[Pythagorean theorem]
\label{pythagorean}
This is a theorem about right triangles and can be summarised in the next
equation
\[ x^2 + y^2 = z^2 \]
\end{theorem}

And a consequence of theorem \ref{pythagorean} is the statement in the next
```

corollary.

```
\begin{corollary}
There's no right rectangle whose sides measure 3cm, 4cm, and 6cm.
\end{corollary}

You can reference theorems such as \ref{pythagorean} when a label is assigned.


\begin{lemma}
Given two line segments whose lengths are \(a\) and \(b\) respectively there is a
real number \(r\) such that \(b=ra\).
\end{lemma}

\begin{definition}[Absolute value function]
The absolute value function can be specified as a two-part definition as follows: \\
$
|x| =
\left\{
    \begin{array}{ll}
        x  & \mbox{if } x \geq 0 \\
        -x & \mbox{if } x < 0
    \end{array}
\right.
$
\end{definition}

\end{document}
```

Output



Question 9

References in LaTeX

Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section

Latex Code

```
\documentclass{article}
\usepackage[numbers]{natbib} % Use the 'natbib' package for citation management
\begin{document}
\title{Document that Consists of Two Paragraphs with a minimum of 10 Citations in it and Displaying the References in the Section}
\date{}
\maketitle
% Write two paragraphs with at least 10 citations
\paragraph{Paragraph 1}
The theory of relativity has been explored extensively in various scientific papers \citep{author1, author2, author3}. Einstein's contributions to physics are profound and have paved the way for many modern discoveries \citep{author4, author5}. Researchers continue to investigate the complexities of spacetime and the universe \citep{author6, author7}. These
```

advancements have led to new methods of measurement and analysis in cosmology \citep{author8}.
\paragraph{Paragraph 2}
Recent studies have focused on the impact of climate change on various ecosystems \citep{author9, author10}. Scientists are examining how rising temperatures and changing weather patterns affect biodiversity and human health \citep{author11, author12}. Furthermore, interdisciplinary research has brought about innovative solutions for sustainable development \citep{author13}. Collaboration among experts from different fields is essential to address the challenges of global warming \citep{author14}.
% Add a references section
\newpage % Optional: Start the references on a new page
\begin{thebibliography}{99}
\bibitem{author1} Author One. \textit{Title of Article One}. Journal Name, vol. 10, no. 1, pp. 1--10, 2022.
\bibitem{author2} Author Two. \textit{Title of Book Two}. Publisher Name, 2021.
\bibitem{author3} Author Three. \textit{Title of Conference Paper Three}. In: Proceedings of Conference, pp. 100--110, 2020.
\bibitem{author4} Author Four. \textit{Title of Article Four}. Journal Name, vol. 9, no. 2, pp. 15--25, 2019.
\bibitem{author5} Author Five. \textit{Title of Book Five}. Publisher Name, 2018.
\bibitem{author6} Author Six. \textit{Title of Conference Paper Six}. In: Proceedings of Conference, pp. 200--210, 2017.
\bibitem{author7} Author Seven. \textit{Title of Article Seven}. Journal Name, vol. 8, no. 3, pp. 30--40, 2016.
\bibitem{author8} Author Eight. \textit{Title of Book Eight}. Publisher Name, 2015.

\bibitem{author9} Author Nine. \textit{Title of Conference Paper Nine}. In: Proceedings of Conference, pp. 300--310, 2014.
\bibitem{author10} Author Ten. \textit{Title of Article Ten}. Journal Name, vol. 7, no. 4, pp. 50--60, 2013.
19
\bibitem{author11} Author Eleven. \textit{Title of Article Eleven}. Journal Name, vol. 6, no. 5, pp. 70--80, 2012.
\bibitem{author12} Author Twelve. \textit{Title of Article Twelve}. Journal Name, vol. 5, no. 6, pp. 90--100, 2011.
\bibitem{author13} Author Thirteen. \textit{Title of Book Thirteen}. Publisher Name, 2010.
\bibitem{author14} Author Fourteen. \textit{Title of Conference Paper Fourteen}. In: Proceedings of Conference, pp. 400--410, 2009.
\end{thebibliography}
\end{document}

OUTPUT

Document that Consists of Two Paragraphs with a minimum of 10 Citations in it and Displaying the References in the Section

Paragraph 1 The theory of relativity has been explored extensively in various scientific papers [1, 2, 3]. Einstein's contributions to physics are profound and have paved the way for many modern discoveries [4, 5]. Researchers continue to investigate the complexities of spacetime and the universe [6, 7]. These advancements have led to new methods of measurement and analysis in cosmology [8].

Paragraph 2 Recent studies have focused on the impact of climate change on various ecosystems [9, 10]. Scientists are examining how rising temperatures and changing weather patterns affect biodiversity and human health [11, 12]. Furthermore, interdisciplinary research has brought about innovative solutions for sustainable development [13]. Collaboration among experts from different fields is essential to address the challenges of global warming [14].

References

[1] Author One. *Title of Article One*. Journal Name, vol. 10, no. 1, pp. 1–10, 2022.

[2] Author Two. *Title of Book Two*. Publisher Name, 2021.

[3] Author Three. *Title of Conference Paper Three*. In: Proceedings of Conference, pp. 100–110, 2020.

[4] Author Four. *Title of Article Four*. Journal Name, vol. 9, no. 2, pp. 15–25, 2019.

[5] Author Five. *Title of Book Five*. Publisher Name, 2018.

[6] Author Six. *Title of Conference Paper Six*. In: Proceedings of Conference, pp. 200–210, 2017.

[7] Author Seven. *Title of Article Seven*. Journal Name, vol. 8, no. 3, pp. 30–40, 2016.

[8] Author Eight. *Title of Book Eight*. Publisher Name, 2015.

[9] Author Nine. *Title of Conference Paper Nine*. In: Proceedings of Conference, pp. 300–310, 2014.

[10] Author Ten. *Title of Article Ten*. Journal Name, vol. 7, no. 4, pp. 50–60, 2013. 19

[11] Author Eleven. *Title of Article Eleven*. Journal Name, vol. 6, no. 5, pp. 70–80, 2012.

[12] Author Twelve. *Title of Article Twelve*. Journal Name, vol. 5, no. 6, pp. 90–100, 2011.

[13] Author Thirteen. *Title of Book Thirteen*. Publisher Name, 2010.

Question 10

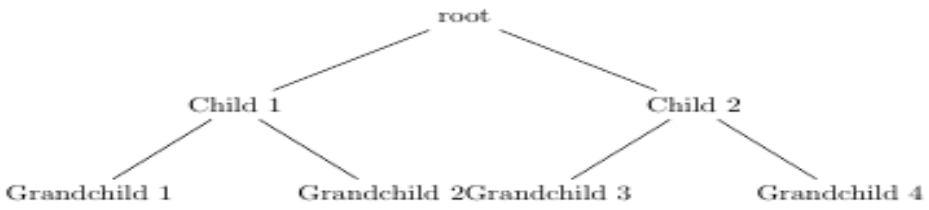
Tikz library

Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library

Latex Code

```
\documentclass{article}
\usepackage{tikz}

\begin{document}

% Tree diagram
\begin{tikzpicture}[
level 1/.style={sibling distance=5.5cm},
level 2/.style={sibling distance=3.5cm}
]

% Root node
%\node[circle, draw, fill=blue!20, text=red, minimum size=2cm] {root}
\node {root}
% Level 1 nodes
child {node {Child 1}
% Level 2 nodes
child {node {Grandchild 1}}
child {node {Grandchild 2}}
}
child {node {Child 2}
child {node {Grandchild 3}}
child {node {Grandchild 4}}
};

\end{tikzpicture}

 \end{document}
```

OUTPUT


root
Child 1
Child 2
Grandchild 1
Grandchild 2
Grandchild 3
Grandchild 4

Question 11

Algorithms in Latex

Develop a Latex script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library

Latex Code

```
\documentclass[10pt,a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{algorithm2e}
\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}
\begin{document}

\section*{Floyd's Algorithm}
Algorithm to find solution to All-Pairs Shortest-Paths Problem

\SetKwComment{Comment}{// }{ }

\vspace{1cm}
\begin{algorithm}[H]
\caption{Floyd(W [1..n, 1..n])}
\SetAlgoLined
\DontPrintSemicolon
\KwIn{The weight matrix W of a graph having vertices [1..n]}
\KwOut{The distance matrix D of the shortest paths' lengths between every pair of vertices [1..n]}
$D$ $\gets$ $W$ \Comment*[r]{initially copy the weight matrix into distance matrix}
\For{$k \gets 1$ to $n$}{
\For{$i \gets 1$ to $n$}{
\For{$j \gets 1$ to $n$}{
$D[i,j]$ $\gets min\{D[i,j], D[i,k] + D[k,j]\}$
}
}
}
\Return{$D$}\;

\end{algorithm}
 \end{document}
```

Output

Floyd's Algorithm

Algorithm to find solution to All-Pairs Shortest-Paths Problem

Input: The weight matrix W of a graph having vertices [1..n]
Output: The distance matrix D of the shortest paths' lengths between every pair of vertices [1..n]

```
D ← W                                   // initially copy the weight matrix into distance matrix
for k ← 1 to n do
    for i ← 1 to n do
        for j ← 1 to n do
            D[i, j] ← min{D[i, j], D[i, k] + D[k, j]}
        end
    end
end
return D
```

Algorithm 1: Floyd(W [1..n, 1..n])

Question 12

Simple Report

Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.

Latex Code

```
\documentclass[6pt,a4paper]{report}
\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage{graphicx}
\usepackage[left=3cm,right=3cm,top=2cm,bottom=2cm]{geometry}
\author{Lekhaka}
\title{Varadhi}
\begin{document}

\maketitle
\chapter{Free Software}
\section*{What is Free Software?}
"\textbf{Free software}" means software that respects users' freedom and community. Roughly, it means that \textbf{the users have the freedom to run, copy, distribute, study, change and improve the software}. Thus, "free software" is a matter of liberty, not price. To understand the concept, you should think of "\textit{free}" as in "\textit{free speech},"  not as in "\textit{free beer}." We sometimes call it "\textbf{libre software}," borrowing the French or Spanish word for "free" as in freedom, to show we do not mean the software is gratis.

You may have paid money to get copies of a free program, or you may have obtained copies at no charge. But regardless of how you got your copies, you always have the freedom to copy and change the software, even to sell copies.

We campaign for these freedoms because everyone deserves them. With these freedoms, the users (both individually and collectively) control the program and what it does for them. When users don't control the program, we call it a "\textit{nonfree}" or "\textit{proprietary}" program. The nonfree program controls the users, and the developer controls the program; this makes the program an instrument of unjust power.

"\emph{Open source}" is something different: it has a very different philosophy based on different values. Its practical definition is different too, but nearly all open source programs are in fact free.

\section*{The Free Software Definition}
The free software definition presents the criteria for whether a particular software program qualifies as free software. \\
\textbf{The four essential freedoms} \\
```

A program is free software if the program's users have the four essential freedoms: \\
\begin{itemize}
\item The freedom to run the program as you wish, for any purpose (freedom 0).
\item The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
\item The freedom to redistribute copies so you can help others (freedom 2).
\item The freedom to distribute copies of your modified versions to others (freedom 3).

\end{itemize}

By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this. \\

A program is free software if it gives users adequately all of these freedoms. Otherwise, it is nonfree. While we can distinguish various nonfree distribution schemes in terms of how far they fall short of being free, we consider them all equally unethical.

\chapter{Listing Environment}

\begin{small}
\section*{Unordered lists}

\subsection*{Groceries List}
\begin{itemize}
\item Eggs
\item Milk
\item Biscuits
\item Rice
\end{itemize}

\subsection*{Football Teams}

\begin{itemize}
\item English Premier League
\begin{itemize}
\item Manchester United
\item Liverpool
\end{itemize}
\item La Liga
\begin{itemize}
\item Barcelona
\item Real Madrid
\end{itemize}

\item Bundesliga
\begin{itemize}
\item Bayern Munich

```
\item Borussia Dortmund
\end{itemize}
\end{itemize}

\section*{Ordered lists}
\subsection*{ICC WTC Rankings}
\begin{enumerate}
\item India
\item Australia
\item New Zealand
\end{enumerate}

\subsection*{Countries ranked by Market Cap}
\begin{enumerate}
\item Asia
\begin{enumerate}
\item China
\item Japan
\item India
\end{enumerate}

\item Europe
\begin{enumerate}
\item United Kingdom
\item France
\item Germany
\end{enumerate}

\end{enumerate}
\end{small}


 \end{document}
```

OUTPUT

Chapter 1

Free Software

What is Free Software?

"**Free software**" means software that respects users' freedom and community. Roughly, it means that **the users have the freedom to run, copy, distribute, study, change and improve the software**. Thus, "free software" is a matter of liberty, not price. To understand the concept, you should think of "*free*" as in "*free speech*," not as in "*free beer*." We sometimes call it "**libre software**," borrowing the French or Spanish word for "free" as in freedom, to show we do not mean the software is gratis.

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"*Open source*" is something different: it has a very different philosophy based on different values. Its practical definition is different too, but nearly all open source programs are in fact free.

The Free Software Definition

The free software definition presents the criteria for whether a particular software program qualifies as free software.

The four essential freedoms

A program is free software if the program's users have the four essential freedoms:

- The freedom to run the program as you wish, for any purpose (freedom 0).
- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help others (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3).

By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

A program is free software if it gives users adequately all of these freedoms. Otherwise, it is nonfree. While we can distinguish various nonfree distribution schemes in terms of how far they fall short of being free, we consider them all equally unethical.

Chapter 2

Listing Environment

Unordered lists

Groceries List

- Eggs
- Milk
- Biscuits
- Rice

Football Teams

- English Premier League
  - Manchester United
  - Liverpool
- La Liga
  - Barcelona
  - Real Madrid
- Bundesliga
  - Bayern Munich
  - Borussia Dortmund

Ordered lists

ICC WTC Rankings

1. India
2. Australia
3. New Zealand

Countries ranked by Market Cap

1. Asia
   (a) China
   (b) Japan
   (c) India
2. Europe
   (a) United Kingdom
   (b) France
   (c) Germany