This document is created for my own personal reference while learning \LaTeX. Most of the material is gathered by surfing Internet and the credit goes to their original authors. I hope some day I could organize this document well.

1 Sample Document

\documentclass{article}
\title{Introducing \LaTeX}
\author{Kamlesh and Kunal}
\setlength{\parindent}{0mm}
\setcounter{topdepth}{4}
\begin{document}
\maketitle
\listoffigures
\listoftables
\tableofcontents
\begin{abstract}
This is abstract
\end{abstract}
\section{Introduction}
Let me introduce the topic
\subsection{First}
section can have subsections
\subsection{Second}
subsection can have subsubsections
\subsection{Third}
\end{document}

1.1 Document structure
A latex document can be of type of an article or a book.

\documentclass{book}
\documentclass{article}
\author{Kamlesh and Kunal}
\setlength{\topmargin}{0.0pt}
\setlength{\oddsidemargin}{0.0pt}
\setlength{\evensidemargin}{0.0pt}
\setlength{\textwidth}{60.0cm}
\setlength{\headheight}{0.0pt}
\setlength{\headsep}{0.0pt}
\setlength{\footskip}{0.0pt}
\begin{document}
\maketitle
\listoffigures
\listoftables
\tableofcontents
\begin{abstract}
This is abstract
\end{abstract}
\section{Introduction}
Let me introduce the topic
\subsection{First}
section can have subsections
\subsection{Second}
subsection can have subsubsections
\subsection{Third}
\end{document}

1.2 Font, space
\thispagestyle{empty}
\pagenumbering{roman}
\hrulefill
\rule{250pt}{0.5pt} Horizontal line
\textsc{\thesisTitle} \normalsize
\texttt{ktiwari@cse.iitk.ac.in}
\vfill \[1cm] New Line after 1cm empty space.
\newpage \clearpage \newpage
\setcounter{page}{1}
\def\name{Kamlesh Tiwari}
\include{coverPages}
\cleardoublepage \input{thesisChapter01}

For setting up line spacing in document following code can be used.

\usepackage{setspace}
\doublespacing \singlespacing \onespacing \setstretc{1.8}
\hspace{1cm}

To Write text in box use \fbox.

\fbox{To Write text in box use \fbox.}

Writing a text in vertical direction or at any other angle one can use \rotatebox command as below with the inclusion of graphicx package.

A\rotatebox{90}{B}\rotatebox{270}{C}
A\rotatebox{270}{B}\rotatebox{90}{C}
A\rotatebox{270}{C}\rotatebox{90}{A}

Use ! to bring the things closer and ; to push them farther away. See example: ab ab ab

Following code can be used for customizing the appearance fonts by stretching.

\usepackage{rotating} \% in preamble
\resizebox{5cm}{0.5cm}{\textbf{IIT Kanpur}}

1.3 Margin Notes
For one-sided layout (simplex), the text will be placed in the right margin, starting from the line where it is defined. For two-sided layout (duplex), it will be placed in the outside margin and for two-column layout it will be placed in the nearest margin.

\marginpar{margin text}
\marginpar{left text}{right text}
To change the whole document in landscape mode use \documentclass[landscape]{report}. A single page can be changed with package \texttt{geometry}\texttt{-package} as \texttt{\usepackage[landscape]{geometry}}. To write anything in circle use \texttt{\usepackage{tikz}} and write following line in main text.

\begin{tikz}
\node[draw,circle]{Text};
\end{tikz}

\subsection{Writing in Hindi}

We can also create the documents in native languages like HINDI, read the article\footnote{http://pravin.insanitybegins.com/posts/using-devanagari-in-latex/} on internet. It requires the use of package \texttt{devanagari}.

\subsection{Few Symbols}

<table>
<thead>
<tr>
<th>Latex command</th>
<th>Package to include</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Gamma$</td>
<td>Gamma</td>
</tr>
<tr>
<td>$\Sigma$</td>
<td>varSigma</td>
</tr>
<tr>
<td>$\Sigma$</td>
<td>Sigma</td>
</tr>
<tr>
<td>$\delta$</td>
<td>delta</td>
</tr>
<tr>
<td>$\Delta$</td>
<td>Delta</td>
</tr>
<tr>
<td>$\xi$</td>
<td>xi</td>
</tr>
<tr>
<td>$\subseteq$</td>
<td>subseteq</td>
</tr>
<tr>
<td>\backslash</td>
<td>setminus</td>
</tr>
<tr>
<td>$\cap$</td>
<td>cap</td>
</tr>
<tr>
<td>$\rightarrow$</td>
<td>rightarrow</td>
</tr>
<tr>
<td>$\mid$</td>
<td>mid</td>
</tr>
<tr>
<td>$\bigcup$</td>
<td>bigcup</td>
</tr>
<tr>
<td>$\checkmark$</td>
<td>checkmark</td>
</tr>
<tr>
<td>$\pi$</td>
<td>pi</td>
</tr>
<tr>
<td>$\subseteq$</td>
<td>subset</td>
</tr>
<tr>
<td>$\forall$</td>
<td>forall</td>
</tr>
<tr>
<td>$\Leftarrow$</td>
<td>Leftarrow</td>
</tr>
<tr>
<td>$\llcorner$</td>
<td>llcorner</td>
</tr>
<tr>
<td>$\lrcorner$</td>
<td>lrcorner</td>
</tr>
<tr>
<td>$\mapsto$</td>
<td>mapsto</td>
</tr>
<tr>
<td>$\sqcup$</td>
<td>square</td>
</tr>
<tr>
<td>$\varphi$</td>
<td>varphi</td>
</tr>
<tr>
<td>$\star$</td>
<td>star</td>
</tr>
<tr>
<td>$\neq$</td>
<td>neq</td>
</tr>
<tr>
<td>$\approx$</td>
<td>overset{o}{\kappa}</td>
</tr>
<tr>
<td>$\bigcap$</td>
<td>bigcap</td>
</tr>
<tr>
<td>$\epsilon$</td>
<td>epsilon</td>
</tr>
<tr>
<td>$\ln$</td>
<td>mathbb{N}</td>
</tr>
<tr>
<td>$\infty$</td>
<td>infty</td>
</tr>
<tr>
<td>$\hookrightarrow$</td>
<td>hookrightarrow</td>
</tr>
<tr>
<td>$\mathbb{R}$</td>
<td>mathbb{R}</td>
</tr>
<tr>
<td>$\mathbb{A}$</td>
<td>mathbb{AB}</td>
</tr>
<tr>
<td>$\mathfrak{A}$</td>
<td>mathfrak{AB}</td>
</tr>
<tr>
<td>$\mathfrak{M}$</td>
<td>mathfrak{AB}</td>
</tr>
<tr>
<td>$\mathbb{M}$</td>
<td>mathbb{AB}</td>
</tr>
<tr>
<td>$\mathcal{M}$</td>
<td>mathcal{AB}</td>
</tr>
<tr>
<td>$\mathbb{I}$</td>
<td>mathbb{I}</td>
</tr>
<tr>
<td>$\mathbb{Z}$</td>
<td>mathbb{Z}</td>
</tr>
<tr>
<td>$\mathbb{R}$</td>
<td>mathbb{R}</td>
</tr>
<tr>
<td>$\mathfrak{M}$</td>
<td>mathfrak{AB}</td>
</tr>
<tr>
<td>$\mathcal{M}$</td>
<td>mathcal{AB}</td>
</tr>
<tr>
<td>$\text{\LaTeX}$</td>
<td>\LaTeX</td>
</tr>
</tbody>
</table>

Some more symbols: alpha $\alpha$, beta $\beta$, gamma $\gamma$, Gamma $\Gamma$, delta $\delta$, Delta $\Delta$, epsilon $\epsilon$, zeta $\zeta$, eta $\eta$, theta $\theta$, Theta $\Theta$, kappa $\kappa$, lambda $\lambda$, Lambda $\Lambda$, mu $\mu$, nu $\nu$, xi $\xi$, Xi $\Xi$, pi $\pi$, Pi $\Pi$, rho $\rho$, sigma $\sigma$, tau $\tau$, phi $\phi$, Phi $\Phi$, chi $\chi$, psi $\psi$, Psi $\Psi$, omega $\omega$, Omega $\Omega$.

\subsection{Modifying character appearance}

- $\overleftarrow{g \cdot a}$ \texttt{\usepackage{amsmath}}

- $\overrightarrow{g \cdot b}$ \texttt{\usepackage{amsmath}}

- $\overbrace{\text{Text}}$ \texttt{\LaTeX}

In the same way \texttt{\underbrace{Text}} can be used.

\begin{equation*}
M(x) = \begin{cases} 
0 & \text{if } M \text{ does NOT accepts } x \\
1 & \text{if } M \text{ accepts } x
\end{cases}
\end{equation*}
Lists can be of following types

1.9 Lists

Lists can be of following types

- \begin{itemize}
  \item one
  \item two
  \item three
  \end{itemize}

- \begin{enumerate}
  \item Apple
  \item Banana
  \item Grapes
  \end{enumerate}

- \begin{enumerate}[[I]]
  \item Apple
  \item Banana
  \item Grapes
  \end{enumerate}

1.7 Document Properties

\hypersetup{
  pdfauthor={Kamlesh Tiwari},
  pdftitle={Learn Latex},
  pdfkeywords={latex, help, ok ...}
}

Making references (index entries and citations) as hyperlinks (clickable). Write following in preamble.

\usepackage{hyperref}
\hypersetup{
  colorlinks=false,
  citecolor=blue,
  filecolor=black,
  linkcolor=blue,
  urlcolor=black
}

1.8 Colored text

\usepackage{color}
Writing in \textcolor{red}{red color} is easy.

Writing in color like \textcolor{red}{red}, \textcolor{blue}{blue}, \textcolor{green}{green}, \textcolor{cyan}{cyan} is easy.

- \begin{itemize}
  \item one
  \item two
  \item three
  \end{itemize}

- \begin{enumerate}
  \item Apple
  \item Banana
  \item Grapes
  \end{enumerate}

- \begin{enumerate}[[I]]
  \item Apple
  \item Banana
  \item Grapes
  \end{enumerate}

The bullets can be changed for each level using the following command:

\renewcommand{$\bullet$}{\textbullet}
\renewcommand{$\circ$}{\textcircled{}}
\renewcommand{$\cdot$}{\textbullet}
\renewcommand{$\ast$}{\textast}

The space between different items can be controlled with the \texttt{itemsep} command:

\begin{itemize}[itemsep2pt]
\end{itemize}

To change enumerated lists counters itemize labels are accessed via \texttt{\labelitemi}, \texttt{\labelitemii}, \texttt{\labelitemiii}, \texttt{\labelitemiv}, for the four respective levels.

\begin{enumerate}
  \item First one
  \setcounter{enumi}{4}
  \item fifth element
\end{enumerate}

1. First one
5. fifth element

\textbf{Inline lists} are the lists in the running text. We have to use package \texttt{paralist} for the purpose.

\usepackage{paralist}
\textbf{Inline lists}, which are sequential in nature, just like enumerated lists, but are
1.10 Inserting images

After using the package `graphicx`, you can use `includegraphics` command to include a .png, .gif, .jpg, .jpeg or .pdf file. You can specify values like width=xx, height=xx, keepaspectratio, scale=xx, angle=xx, trim=llx lbr t, clip, page=x

```latex
\usepackage{graphicx}
\includegraphics
[attrib=value1, ..., attrib=value1]{imagename}
\includegraphics{scale=0.5, angle=180}{figName}
[width=0.5, height=100, trim=10mm 80mm 20mm 5mm, clip, width=3cm]
```

A proper way to insert the graphics with a border around it and with a describing title is as below

```latex
\begin{figure}[htbp]
\centering
\includegraphics{filename}
\caption{White Token}
\label{labelname}
\end{figure}
```

Note: To include a .eps image (1) use package `graphicx` and `epsfig` in preamble and insert image by `\includegraphics` (2) Compile by `latex fileName.tex` and then convert to pdf by `dvi+ips -Ppdf fileName.dvi` you will get `fileName.pdf`

### 1.10.1 Special effects in image appearance

Package `subfigure` is used when we need to include more than one figure in a row. New line operator `\` will produce another row. Following is the command and output.

```latex
\begin{figure}[htp]
\begin{center}
\subfigure[image1]
{\label{fig:edge-a}
\includegraphics[scale=0.3]{kt.jpg}}
\subfigure[image2]
{\label{fig:edge-b}
\includegraphics[scale=0.3]{kt.jpg}} \hspace{1cm}
\subfigure[image3]
{\label{fig:edge-c}
\includegraphics[scale=0.3]{kt.jpg}}
\end{center}
\caption{More than one figure in a row}
\label{fig:edge}
\end{figure}
```

![Figure 1: More than one figure in a row](image1)

![Figure 2: more](image2)

![Figure 3: more](image3)
Some times you may get an error saying “to many unprocessed floats”. This can be corrected by placing \clearpage at right place.

1.11 Table of contents, bibliography, and index

- Table of contents can be generated by

```latex
\tableofcontents
\listoffigures
\listoftables
```

- Printing of index is a two stage process. First use command \index to create an index entry for the file and then using \printindex.

```latex
\index{late binding}
\index{algorithm!recursive}

\index{database}

\printindex
```

- To include all references written in file eCashRefOld.bib and to add the reference in table of contents write as below.

```latex
eCashRefOld.bib
```

```latex
@article{varadhara\textsc{jan}1999der ,
  title={On the design . . . h schemes} ,
  author={Varadharajan, M. Y.} ,
  journal={Theoretical Computer Science} ,
  volume={226} ,
  number={1-2} ,
  pages={173-184} ,
  year={1999} ,
  publisher={Elsevier} }
```

In the source file say \texttt{myPaper.tex} write following lines at the end of document before the \end{document}.

```latex
\def \bibname{References etc... }
\nocite{*} \bibliographystyle{plain}
\bibliography{eCashRefOld}
```

In the document \texttt{myPaper.tex} to refer an entry of eCashRefOld.bib (say article \texttt{varadhara\textsc{jan}1999der}), write \cite{varadhara\textsc{jan}1999der} at the place. Note that spaces are not accepted so \cite{varadhara\textsc{jan}1999der} or \cite{varadhara\textsc{jan}1999der} will be an error.

We can write an additional line \addcontentsline{toc}{chapter}{References} to include the word \textit{Reference} in table-of-contents as chapter.

- note the in .bib file an item for \texttt{book} must have (title, author, year, publisher), \texttt{inproceedings} must have (title, author, booktitle, pages, year), \texttt{article} must have (title, author, journal, volume, number, pages, year). Always avoid following errors

```latex
@article{varadhara\textsc{jan}1999der ,
  title={{On the design . . . h schemes}} ,
  author={Varadharajan, M. Y.} ,
  journal={Theoretical Computer Science} ,
  volume={226} ,
  number={1-2} ,
  pages={173-184} ,
  year={1999} ,
  publisher={Elsevier} }
```

- While submitting source files in journal (say \texttt{neurocomputing}) requires to create a \texttt{.bbl} file, (use command \texttt{latex main}) requires to create a \texttt{.bbl} file, (use command $latex main; \$ bibtex main; $ latex main; $ latex main).

Also you may have to convert all .jpg files in .pdf (or \texttt{.eps}) format (you can use pdflatex than). Be ready with your picture and short biography while uploading.

- While preparing manuscript for ACM transactions, it requires the balancing of references in the two columns. This can be done by placing \vfill\eject at the required place in the bibliography list of \texttt{.bbl} file. Further, you can use the program \texttt{pdf2ps} to .ps file for upload.

- Title is automatically changed to lower case by latex for example if you write the title as “The PolyU database” then it is automatically converted to “The polyu database”. To prevent this unwanted lowering of PolyU one can write this in curly brackets as “The {PolyU} database”. A similar example is shown for \texttt{misc} in reference ThRef2 above.

- Back referencing which prints the page numbers where the particular reference is quoted, can be done by just including \texttt{hyperref} package in the preamble. Include following line.

```latex
\usepackage[backref=page]{hyperref}
```

Removing ugly boxes: This package draws boxes around the references which looks ugly. They can be suppressed by including following lines in the preamble.
1.12 Question paper / multi-column

Sometimes we want to have more than one column in the document in between the text. Like in preparing question papers, we want answer choices in two columns. Use package `multicol`.

Do you know the answer of a question given here in this text? If yes please select one choice from the list given below from

\begin{multicols}{2} \% 2 columns
\begin{enumerate}
\item Choice one
\item Choice two
\item Choice three
\item Last choice
\end{enumerate}
\end{multicols}

Do you know the answer of a question given here in this text? If yes please select one choice from the list given below from

1. Choice one
2. Choice two
3. Choice three
4. Last choice

1.12.1 Listing package

Preamble

\usepackage{listings}
\renewcommand{\lstlistingname}{Program }
\renewcommand{\lstlistlistingname}{List of Prog.}

In Begin Document

\lstset{language=C++,
  showstringspaces=false ,
 :stringstyle={ttfamily},
  basicstyle=\small}

When writing a program in file, write as below.

\begin{lstlisting}[frame=lines,
  caption={Write a program ...}]# include<stdio.h>
void main()
{
  int a, b, sum;
  printf("\n Enter first number\n");
  scanf("%d", \&a);
  printf("\n Enter second number\n");
  scanf("%d", \&b);
  sum = a + b;
  printf("\n Sum is %d\n", sum);
}
\end{lstlisting}

The produced effect will be as below.

Listing 1: Write a program ...

\begin{verbatim}
\# include <stdio.h>
void main()
{
  int a, b, sum;
  printf("\n Enter first number\n");
  scanf("%d", \&a);
  printf("\n Enter second number\n");
  scanf("%d", \&b);
  sum = a + b;
  printf("\n Sum is %d\n", sum);
}
\end{verbatim}

In our case to print list of programs, write following statement.

\begin{verbatim}
\ls l i s t o f l i s t i n g s
\end{verbatim}

NOTE: the simplest way to write programs in latex document is by using `verbatim` command as below

\begin{verbatim}
eqn:= diff( y(t), t, t ) + 4*y(t) = 0:
init:= y(0) = 1, D( y)(0) = -1:
dsolve( \{eqn, init\}, y(t) )
\end{verbatim}

Whatever you write here, will go as it is in output

\end{verbatim}

2 Mathematics

2.1 Integration

When working in math mode (this are within { } or [ ] bracket) Integration can be produced in two ways as below.

1. \int_{-\pi}^{+\pi}
\begin{matrix}
\cos x \\
\sin x
\end{matrix}
\end{matrix}

+ \pi
- \pi
\int_{-\pi}^{+\pi}
\begin{matrix}
\cos x \\
\sin x
\end{matrix}
\end{matrix}

2. \int_{-\pi}^{+\pi}
\begin{matrix}
\sin x \times cos x
\end{matrix}
\end{matrix}

+ \pi
- \pi
\int_{-\pi}^{+\pi}
\begin{matrix}
\sin x \times cos x
\end{matrix}
\end{matrix}

3. \mathop{\int_{-\pi}^{+\pi}}\{+\pi\}
\begin{matrix}
\bigg( \int_{-\pi}^{+\pi} x \bigg)
\end{matrix}
\end{matrix}

4. Also consider

\begin{verbatim}
\mathop{\int_{\ell}^{\ell}}\{+\pi\}
\end{verbatim}
2.2 Text in math mode

Include package `amsmath` and use \text{} to write text in math environment.

\[
\lim_{x \to \infty} \frac{x}{x - 1}
\]

\[
\int_0^\infty e^{-x^2} \, dx = \sqrt{\frac{\pi}{2}}
\]

\[
\begin{array}{c}
\int_0^\infty e^{-x^2} \, dx = \sqrt{\frac{\pi}{2}}
\end{array}
\]

\[
\begin{array}{c}
\int_0^\infty e^{-x^2} \, dx = \sqrt{\frac{\pi}{2}}
\end{array}
\]

\[
\begin{array}{c}
\int_0^\infty e^{-x^2} \, dx = \sqrt{\frac{\pi}{2}}
\end{array}
\]

2.3 Inline and Displayed Formulas

- \[
x = \sin(x \times \text{This is text in math mode}) \text{ but this is not}
\]

$\text{This is text in math mode)butthisisnot}$
In equation (2) we saw (5)

\[ x = \sin \alpha = \cos \beta \]
\[ = \cos(\pi - \alpha) = \sin(\pi - \beta) \]

\begin{align*}
  x &= \sin \alpha = \cos \beta \\
  &= \cos(\pi - \alpha) = \sin(\pi - \beta)
\end{align*}

In equation (2) we saw \( x = y + 3 \) \hspace{1cm} (2)

In equation (3) we saw \( x = y + 3 \) \hspace{1cm} (3)

\begin{align*}
  \int 1 &= x + C \\
  x &= \frac{x^2}{2} + C \\
  x^2 &= \frac{x^3}{3} + C
\end{align*} \hspace{1cm} (4)

\begin{align*}
  \int 1 &= x + C \\
  x &= \frac{x^2}{2} + C \\
  x^2 &= \frac{x^3}{3} + C
\end{align*} \hspace{1cm} (5)

Accents in text mode:

\text{gar\’c con} \ii \text{t’\’o\’n\’g\’a\’n naiv\’e naiv\’e Ha\’cek \’\”om}

Accents in math mode:

\[ \hat{x}, \check{x}, \tilde{a}, \bar{\ell}, \dot{y}, \ddot{y}, \vec{x}, \vec{z}, \dddot{x}, \dddot{z} \]

Wide accents, under and overline:

\[ \hat{T} = \vec{T}, \overline{T}, \overline{\overline{a}}, \underline{\bar{b} + c + d} \]

\[ \overline{\overline{a}^2 + \overline{\overline{a} + b + c + d}} \]

\[ \overline{\overline{a} + b + c + d} \]

\[ \overline{\overline{a} + b + c + d} \]

\[ \alpha^2 + xy + z \]

- \( \left[ \begin{array}{ccc} 1 & 2 \\ 3 & 4 \end{array} \right] \)

- \( \underbrace{a+\overbrace{b+\cdots}}_{\text{total}} + z = t \)

- \( \text{comb}(x,y,\Delta x,\Delta y) = \sum_{m,n=-\infty}^{\infty} \delta(x-m\Delta x,y-n\Delta y) \)

### 3 Creating table

- \( \begin{tabular}{|c|c|c|} \hline S.No. & Name & In2column \\
\hline 1 & 2 & 3-4 \end{tabular} \)

- \( \text{@(xxx)} \) is used to make xxx as column separator.

- By array package \( \{\text{cmd}\} \) are used to alter column specifications \( \{\text{cmd}\} \).

- To create multi-row tables following code can be used.

### Table with colored cell

- \( \begin{tabular}{|l|c|c|c|} \hline Mon & 01 & 08 & 15 \\
\hline Tue & 02 & 09 & 16 \\
\hline Wed & 03 & 10 & 17 \\
\hline Thu & 04 & 11 & 18 \\
\hline Fri & 05 & 12 & 19 \\
\hline Sat & 06 & 13 & 20 \\
\hline \end{tabular} \)

- \( \text{Table can have a caption and label} \)

- \( \text{Alternate Row Colors in Tables} \)

- \( \text{Table with colored cell} \) is easy, a particular cell in the table can be colored by preceding it by \( \text{cellcolor}[gray](0.9) \) include the package \( \text{usepackage[tabular]{xcolor}} \).
To produce the effect below the code is given below.

```latex
\begin{figure}[t]
\begin{minipage}{.45\linewidth}
\captionof{table}{First list}
\begin{tabular}{l l l l l l}
\hline
Name & marks \\
Rajesh & 15 \\
Rahul & 33 \\
Kunal & 21 \\
\hline
\end{tabular}
\end{minipage}
\end{figure}
```

Table 2: First list

Table 3: First list

4 Picture environment

```latex
\setlength{\unitlength}{5pt}
\begin{picture}(40,20)(-2,0)
\put(5.3){\oval(17.4)}
\put(12,12){Want to write a text ?}
\put(13,6){\vector(1,0){6}}
\qbezier(32,1)(29,-5)(23,1)
\end{picture}
```

Want to write a text?

Another approach is very exciting

1. Create picture using xfig
2. Save and export to latex picture. Say with name p1.tex
3. Use following packages.\footnote{usepackage{tikz} \ usepackage{arrows}} OR \footnote{usepackage{color} \ usepackage{epsfig}}
4. Write following lines to include the picture in your .tex source file.

```latex
\begin{figure}[t]
\centering
\scalebox{0.8}{\input{p1}}
\caption{Example hd(A,B)}
\label{fig:hd}
\end{figure}
```

3.1 Mini page

To produce the effect below the code is given below.

```latex
\begin{minipage}{.4\textwidth}
\textwidth
First part \ is written as it is \ without care
\end{minipage}
\begin{minipage}{.4\textwidth}
\textwidth
Second part \ is also written as it is \ without care
\end{minipage}
```

3.2 Side by side table

Two tables on a same page can be produced as below. Use an additional package caption. Begin and end figure are used to make the minipage as a floating environment.
5  Footnote

Simple footnote can easily be inserted by writing
\footnote{Text to be put in footnote}

The footnote will appear as by showing a number to link the footnote text. Sometimes it is required to use symbols to link the footnote, for those cases we can use following code.

\% In preamble (before begin document)
\begin{longdef}
\begin{description}
\item[]\symbolfootnote[1]{Let ....}
\end{description}
\end{longdef}

6  Page Margins Adjustment

Write these in preamble.
\usepackage[top=1cm, bottom=1cm, left=1cm, right=1cm]{geometry}

7  Fancy Headres

Write these in preamble.
\usepackage{bolsel}
\usepackage{lscape}
\usepackage{fancyhdr}
\pagestyle{fancy}
\fancyhead{}
\fancyfoot{}
\lhead{CS640: Computational Complexity}
\rhead{Instr.: Prof. Somễnath Biswas (sb@)}
\lfoot{CSE, IIT Kanpur}
\cfoot{Page: \thepage/\pageref{LastPage}}
\rfoot{ktiwi@cse.iitk.ac.in}
\renewcommand{\headrulewidth}{0.4pt}
\renewcommand{\footrulewidth}{0.4pt}

8  Page Border

Write these in preamble. For single border try this
\usepackage{fancybox}
\fancypage{\fbox}{ }

and for double border try below
\usepackage{fancybox}
\fancypage{\setlength{\fboxsep}{10pt}\fbox}{ }

9  Line between columns for two column document

Write these in preamble.
\usepackage{multicol}
\setlength{\columnseprule}{0.4pt}
\setlength{\columnsep}{15pt}

10  Custom Function

\newcommand{\conpc}{}{\textbf{coNP}}{complete}
\newcommand{\conpc}{}{\textbf{\textit{coNP}}}{complete}

11  Custom Counter

\newcounter{\Lecture}
\stepcounter{\Lecture}
\textbf{\Lecture}\# \textbf{\theLecture} \#\textbf{\#1}

12  LaTeX Counters

Everything LaTeX numbers for you has a counter associated with it. The name of the counter is the same as the name of the environment or command that produces the number. Below is a list of the counters used LaTeX’s standard document styles to control numbering.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>part</td>
<td>part</td>
<td>\addtocounter{counter}{value} increments counter by the amount, which can be negative</td>
</tr>
<tr>
<td>chapter</td>
<td>chapter</td>
<td>\alph{counter}, \Alph{counter} print the value of the counter as a lower or upper case letter.</td>
</tr>
<tr>
<td>section</td>
<td>section</td>
<td>\arabic{counter} print the value of the counter as an arabic number</td>
</tr>
<tr>
<td>subsection</td>
<td>subsection</td>
<td>\fnsymbol{counter} print the counter as a footnote symbol</td>
</tr>
<tr>
<td>figure</td>
<td>figure</td>
<td>\newcounter define a new counter</td>
</tr>
<tr>
<td>enumi</td>
<td>enumi</td>
<td>\roman{counter}, \Roman{counter} print the value of the counter as a roman letter using lower or upper case letters</td>
</tr>
<tr>
<td>enumii</td>
<td>enumii</td>
<td>\setcounter{counter}{value} assign the value to the counter</td>
</tr>
<tr>
<td>enumiv</td>
<td>enumiv</td>
<td>\usecounter{counter} to be used in list environment.</td>
</tr>
<tr>
<td>enumiv</td>
<td>enumiv</td>
<td>\value{counter} get the value of the counter.</td>
</tr>
</tbody>
</table>

\footnote{Text to be put in footnote}
We can use very useful package `pgfplots` in preamble to write following code in main document.

```latex
\begin{tikzpicture}[scale=0.8]
\begin{axis}[title=Test, xlabel=Y axis, ylabel=X axis, xtick=empty, extra x ticks={1,2,3,4}, extra x tick labels={18−25,26−40,41−60,60+}, legend style={at={(0,−0.2)},anchor=north west,legend columns=3}]
\addplot [smooth,mark=o, color=black, solid]
plot coordinates {(1, 3.390968) (2, 3.628) (3, 3.917949)(4, 4.3062)};
\addlegendentry{All}
\addplot [smooth,mark=square, color=blue, densely dotted]
plot coordinates {(1, 3.483077)(2, 3.625)};
\end{axis}
\end{tikzpicture}
```

13 if .. then ..

```latex
\usepackage{ifthen}
ifthenelse \equal{theX}{0}
    { \parag \hrulefill \parag }
```

14 For loop in latex

Write following lines in preamble

```latex
\newcommand{\forloop}{5\{1\}
{ \setcounter{#2}{#3} \ifthenelse{#4}
    { \#5 \addtocounter{#2}{#1} \forloop[#1]{#2}{\value{#2}}{#4}{#5} } \Else \{ \Fail \} }
And these in main document.

\newcommand{\mycube}{2\{2\}
\begin{tikzpicture}[scale=0.8]
\foreach\x in {0,...,\#1} % Front Box
    \draw[thick] (0,−\x) -- (\#1,−\x); \draw[thick] (\x,0) -- (\#1,\x); % Top & Side rays
\foreach\x in {0,...,\#1} % Top Box
    \draw[thick] (\#1−\x,−(\x+3.8,3.8)); \draw[thick] (\#1−\x,−(\x+3.8,−\x+3.8)); % Bottom Box
\end{tikzpicture}
```

15 Plotting Graphs with points

We can use very useful package `tikz` and `pgfplots` in preamble to write following code in main document.

```latex
\begin{tikzpicture}[scale=0.8]
\begin{axis}[
\end{axis}
```

16 Drawing objects with tikz

One can define own drawing objects by using tikz package. One object named `myCube` is defined below. Call it as `\myCube{12\{0.2}\`

```latex
\newcommand{\mycube}{2\{2\}
\begin{tikzpicture}[scale=0.8]
\foreach\x in {0,0.4714,...,4} % Top Box
    \draw[thick] (\x,\#1−\x) -- (\#1+\x, \x); \draw[thick] (\#1+\x, \x) -- (\#1+\x, \x−\#1); \draw[thick] (\#1,−\x) -- (\#1+\x, \x−\#1); % Bottom Box
\end{tikzpicture}
```
17 Algorithms

To write algorithm you have to use \texttt{algorithm2e} package. When using the package \texttt{algorithm2e} you may have to download file \texttt{algorithm2e.sty} and put that in same directory. The \texttt{\begin{algorithm}} package is used instead of \texttt{algorithm} in twocolumn mode.

\begin{algorithm}[H]
\caption{Range Query using EMD}
\label{alg1}
\begin{algorithmic}[1]
\Require $O_n$: Object set ....
\Ensure $PR$: List of objects in range
\For{$i \leftarrow 1 \text{ to } n$}
\State Find object $O_i$ query object $Q$ in $D$. \\Compute feature $v$ \\Compute distance \\If{$EMD[i] \leq R$} \
\State \hfill $\text{Count}++$. \\Add $O_i$ to $PR$\\ElseIf{$x=8$} this can be done\\EndIf
\Else \Dot this \\EndIf
\ElseIf{$x=8$} This is a good comment HaHaHa \\Repeat this stop condition\{\hfill .... what to do \}
\ElseIf{$x=8$} This is a good comment HaHaHa \hfill \Repeat a one line loop \}
\Switch{the value of $T$} \\
\Case{a value} \{ \
\hfill do this; \\hfill do that; \}
\Case{another value}{one line}; \\Case{last value}{\hfill do this; \hfill break;};
\Other{ \\
\hfill for the other values; \hfill do that; \hfill tcc*[f]{Another comment} }
\EndIf
\If{$EMD[i] \leq R$} \hfill $\text{Count}++$ \\EndIf
\Return $PR$. \\caption{Range Query using EMD}
\end{algorithmic}
\end{algorithm}

Some more stuff that can be used ..

\SetLine
\If\{cond2\} \\If\{ \\Else\ \ElseIf\{$\\ElseIf\{$\\Else\ \ElseIf\{$\\Else\}
\SetLine \\If\{ \\Else\ \ElseIf\{$\\Else\}
\begin{algorithm}[H]
\ForAll{$K\To$}
\end{algorithm}

\end{algorithm}

NOTE: in beamer this package requires \texttt{\begin{algorithm}}[H] instead of \texttt{\begin{algorithm}}
18 To provide \listofX

When a new command \Q in the code file can be produced as below:

\usepackage{tocloft}
\usepackage[english]{babel}
\newcommand{\listXName}{List of Questions}
\newlistof{X}{exp}{\listXName}
\newcommand{Q}{refstepcounter{X}}
\noindent{\textbf{\fbox{Q.\thex}} #1}
\addcontentsline{exp}{X}
\protect\numberline{\textbf{[Q.\thex]}}
\hspace{24 pt} #1 (See \thesection)

we can write \listofX to print the list.

19 Writing letter

\documentclass{letter} \address{I2 SBRA}
\name{Kamlesh Tiwari} \signature{Kamlesh Tiwari}
\begin{document}
\begin{letter}
To,\underline{Principal} ...
\underline{Subject: ... }}
\opening{Dear Sir,}
This is ... with regards.
\closing{Yours faithfully,}
\cc{...}
\encl{...}
\end{letter}
\end{document}

20 Sample Front Page

\documentclass[a4paper,12pt]{article}
\title{\textsc{EE604:Term Paper} \[40 pt]
\textsc{On Image Compression DWT-DCT Algorithm}}\textsc{How Sun Dee, Varun Jeoti} \[30 pt]
\large Instructor: Prof. Sumana Gupta
\[45 pt] Report By
\[30 pt] Kamlesh Tiwari, \texttt{ktiware}
\[10 pt] Deepak Singhal, \texttt{sdeep}
\[70 pt] \includegraphics[\scale=0.4]{iiitkLogo.jpg}
\[30 pt] Department of EE
\[30 pt] Indian Institute of Technology, Kanpur
\}
\date{}
\begin{document}
\maketitle
\thispagemode{empty}
\newpage \clearpage

---

\textsuperscript{5}see document qbFinal.tex