

Page Layout and Style

L^AT_EX has default page layouts and styles which can be used without any difficulty. These default settings can also be customized, if required, which are discussed in this Hour.

5.1 Page Layout

The type of the physical paper for producing a document can be specified as an option to the `\documentclass[]{ }` command, e.g., `\documentclass[a4paper]{article}` for printing an article on A4-size paper (**a4paper** is the type of paper). The types and sizes of the standard papers accepted by the `\documentclass[]{ }` command are listed in Table 5.1. The length of a line and the number of lines per page for printing

Table 5.1 Types and sizes of standard papers accepted by the `\documentclass[]{ }` command

Type of paper	Size	Type of paper	Size
a4paper	210 mm×297 mm	letterpaper (default)	216 mm×279 mm
a5paper	148 mm×210 mm	legalpaper	216 mm×356 mm
b5paper	176 mm×250 mm	executivepaper	184 mm×267 mm

texts are fixed according to the chosen paper-size. Besides the size of a paper, its orientation can also be specified by **portrait** (default) or **landscape** as another option to `\documentclass[]{ }`. In the **portrait** orientation, the longer dimension of a page goes in vertical and shorter dimension in horizontal, while the **landscape** orientation is just opposite to the **portrait** orientation.

5.1.1 Standard Page Layout

There are many L^AT_EX commands controlling various dimensional parameters of the page layout for a document. The commands controlling some important parameters are listed in Table 5.2 on the next page, as well as shown diagrammatically

Table 5.2 Commands controlling some important parameters of a page layout

Layout	Command	Function
Main texts	<code>\textheight</code>	Height of main texts without header and footer.
	<code>\textwidth</code>	Width of main texts without marginal notes.
	<code>\oddsidemargin</code>	Blank space on the left margin of odd-numbered pages, if both-side printing is opted (both-side printing can be opted using the <code>twoside</code> option to the <code>\documentclass[]{ }</code> command).
	<code>\evensidemargin</code>	Blank space on the left margin of even-numbered pages (active only when both-side printing is opted).
Columns	<code>\columnsep</code>	Gap between two columns in multi-column mode.
	<code>\columnseprule</code>	Width of the vertical line separating two columns in multi-column mode (default value is zero so as to make the line invisible).
	<code>\columnwidth</code>	Width of a column in multi-column mode (calculated using the values of <code>\textwidth</code> and <code>\columnsep</code>).
	<code>\linewidth</code>	Width of the lines of texts (usually equal to <code>\columnwidth</code> , but may vary in some environments, like the <code>quotation</code> environment).
Header	<code>\headheight</code>	Height of the header.
	<code>\headsep</code>	Vertical gap between the header and the first line of the main texts.
	<code>\topmargin</code>	Extra vertical space above the header.
Footer	<code>\footskip</code>	Vertical gap between the last line of the main texts and the footer.
Marginal notes	<code>\marginparwidth</code>	Width of marginal notes.
	<code>\marginparsep</code>	Horizontal gap between the main texts and marginal notes.
	<code>\marginparpush</code>	Vertical space between two successive marginal notes.

in Fig. 5.1 on page 39. The `\hoffset` and `\voffset` commands in Fig. 5.1 represent, respectively, the horizontal and vertical coordinates of the reference point, whose default values are usually set to zero. All the standard papers listed in Table 5.1 have some fixed values for the commands controlling the dimensional parameters of a page layout. Even for the same paper, the value of a command may vary with the size of fonts as well as with the type of printing (single-side or both-side). However, the values of these commands are independent of the three standard document-classes of `article`, `book`, and `report`. For a particular setting, the page layout similar to the one shown in Fig. 5.1, along with the values of some parameter controlling commands, can be obtained through the `\layout` command defined in the `layout` package. Such values for the document-class `article` in 12pt fonts on `oneside` printing `a4paper` paper are also shown in Fig. 5.1 (obtained just by executing the `\layout` command), where the values of the commands are given in pt (1pt \approx 0.3515 mm). The commands `\paperheight` and `\paperwidth` represent, respectively, the height and width of the physical paper.

5.1.2 Formatting Page Layout*

Instead of using a standard page layout, a user can create an own layout by assigning suitable values to the layout controlling commands. Such a command can be assigned a new value either through an explicit mathematical expression or through the `\setlength{acomm}{aval}` command, where `acomm` is a command and `aval` is its new value. If a command is not assigned a new value, its default value for the

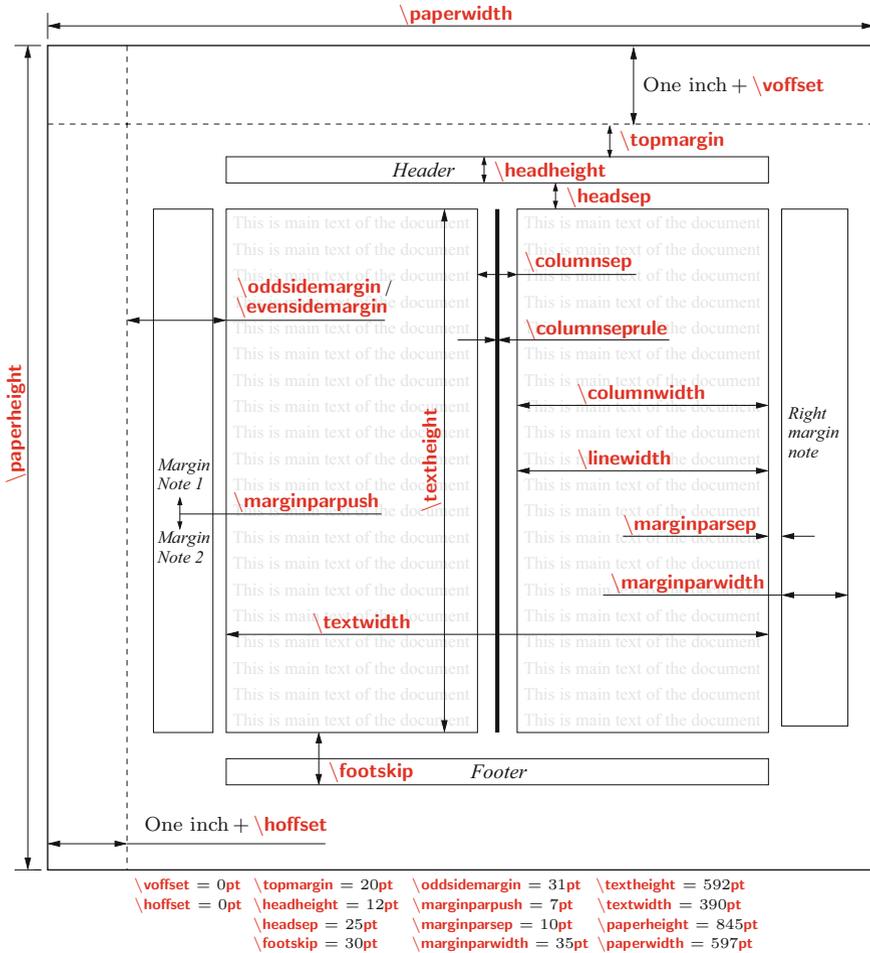


Fig. 5.1 Commands controlling some important parameters of a page layout

chosen paper is used. The values used during drafting this book (the paper is **a4paper**) are shown in Table 5.3 on the next page through both mathematical expression and the `\setlength{...}` command (any one of these forms is to be inserted in the preamble of the input file of a document).

5.1.3 Increasing the Height of a Page*

The commands discussed in §5.1.1 and §5.1.2 format a page layout globally, i.e., their values remain the same on all pages. Sometime, however, the vertical height of a particular page may need to be enlarged locally, specially to accommodate a table

Table 5.3 A manually defined page layout (only one form is to be used in the preamble)

Mathematical expression	Use of the <code>\setlength{}</code> command
<code>\topmargin = 0mm</code>	<code>\setlength{\topmargin}{0mm}</code>
<code>\oddsidemargin = 15mm</code>	<code>\setlength{\oddsidemargin}{15mm}</code>
<code>\evensidemargin = 0mm</code>	<code>\setlength{\evensidemargin}{0mm}</code>
<code>\textheight = 210mm</code>	<code>\setlength{\textheight}{210mm}</code>
<code>\textwidth = 150mm</code>	<code>\setlength{\textwidth}{150mm}</code>
<code>\marginparwidth = 15mm</code>	<code>\setlength{\marginparwidth}{15mm}</code>
<code>\marginparsep = 3mm</code>	<code>\setlength{\marginparsep}{3mm}</code>
<code>\marginparpush = 7mm</code>	<code>\setlength{\marginparpush}{7mm}</code>
<code>\parindent = 5mm</code>	<code>\setlength{\parindent}{5mm}</code>
<code>\footskip = 10mm</code>	<code>\setlength{\footskip}{10mm}</code>

or a figure, or even small piece of texts of a section going to a new page. This can be done through the `\enlargethispage{asize}` or `\enlargethispage*{asize}` command, where `\enlargethispage{}` increases the vertical height of a page by an amount of `asize`, while `\enlargethispage*{}` tries to shrink inter-line spacing to free that amount of space on the page. The commands may be inserted in any place in the input file containing the materials to be printed on the particular page.

5.2 Page Style

Once a page layout is set, the next step is the design of the pages of a document, which mainly includes running header and footer, page numbering, and the front page of a chapter. L^AT_EX provides various standard macros as well as customizing facilities for designing a document. The header and footer, and page numbering are discussed in the following two sections, while the front page of a chapter is covered in §4.2 on page 28.

5.3 Running Header and Footer

The running header and footer on the pages of a document are controlled by the `\pagestyle{}` and `\thispagestyle{}` commands, whose arguments specify a page style. Some commonly used page styles are listed in Table 5.4 on the following page. The `\pagestyle{}` command implements the chosen page style on the current page as well as on the succeeding pages, while `\thispagestyle{}` works locally on the current page only. Usually `\pagestyle{}` is used in the preamble for its global effect, and `\thispagestyle{}` is used inside the `document` environment to suppress the global effect of `\pagestyle{}` on the current page, e.g., `\thispagestyle{empty}` may be used in the title page of a book or a report.

By default, `\thispagestyle{plain}` is issued by the document-classes of `article`, `book`, and `report` to the `\maketitle` command and the first page of major sectioning commands,

Table 5.4 Page styles to control running header and footer in a document

Page style	Package	Function	Application
empty	—	Both the head and foot are empty, and there is no page number (however, the pages are counted).	—
plain	—	The head is empty, but the foot contains the page number at the center of the foot (default in the document-classes article and report).	—
headings	—	The foot is empty, but the head contains the page number as well as title information as determined by a document-class, like chapter and section headings (does not apply to the first page of a chapter).	Refer §5.3.1
myheadings	—	Same with headings except that the page titles in the head are not automatic, but a user has to supply through some commands.	Refer §5.3.2
fancy	fancyheadings	Fully user-defined headers and footers.	Refer §5.3.3
fancy	fancyhdr	Fully user-defined headers and footers.	Refer §5.3.4

like `\part{}` or `\chapter{}`. To suppress the effect of `\thispagestyle{plain}` on these pages, `\thispagestyle{}` with an appropriate page style may be used just after the `\maketitle`, `\part{}` or `\chapter{}` command, e.g., `\thispagestyle{empty}` may be used to suppress the default page numbering on these pages.

5.3.1 Header with the **headings** Style

In the page style **headings**, the running footer is empty, and the header contains the page number and the title of a sectional unit of that page. The position of the page number depends on the type of printing, and the sectional unit whose title appears in the heading depends on the chosen document-class. Different types of headings under the page style **headings** are outlined in Table 5.5. In the case of multiple sectional units on a page, the title of the last unit appears on the header. In the heading, the title of a `\chapter{}` is also preceded by the label-word `CHAPTER` and its serial number, while the title of a `\section{}` or a `\subsection{}` is preceded by its serial number only.

Table 5.5 Styles of headers under the **headings** page style

Option	Page	Document-class		
		article	book	report
(One-side printing)	Odd	Title of <code>\section{}</code> on left and page number on right	Title of <code>\section{}</code> on left, if any, and page number on right	Title of <code>\chapter{}</code> on left and page number on right
	Even	Same with an odd page	Title of <code>\chapter{}</code> on right and page number on left	Same with an odd page
(Two-side printing)	Odd	Title of <code>\subsection{}</code> on left, if any, and page number on right	Same with an odd page of one-side printing	Title of <code>\section{}</code> on left, if any, and page number on right
	Even	Title of <code>\section{}</code> on right and page number on left	Same with an even page of one-side printing	Title of <code>\chapter{}</code> on right and page number on left

5.3.2 Header with the *myheadings* Style

The running header in the page style **myheadings** is the same with that in the page style **headings**. The only difference is that the style of the header under **headings** is predefined, while it is user-defined under **myheadings**. The information about a sectional unit is passed to the running header through a specified marker command, e.g., the marker commands associated with `\chapter{}`, `\section{}`, and `\subsection{}` are `\chaptermark`, `\sectionmark`, and `\subsectionmark`, respectively. Further, the `\markboth{}` and `\markright{}` commands are associated with a marker command. The `\markboth{aeven}{aodd}` command is active under the **twoside** printing option with `aeven` as the contents of the header of even (left hand) pages and `aodd` as that of odd (right hand) pages. In `\markboth{}`, page number is printed on left side of even pages and on right side of odd pages. On the other hand, `\markright{acont}` is appropriate for **oneside** printing option, where `acont` is the contents of the header of all pages.

Generally the information of two different sectional units (e.g., `\chapter{}` and `\section{}`, or `\section{}` and `\subsection{}`) is put on odd and even pages. However, the information of both the sectional units cannot be passed through `\markboth{}` associated with the marker command of a single sectional unit. Therefore, `\markboth{aeven}{}` and `\markright{aodd}` are used in combination, where `aeven` is the information for left hand pages and `aodd` is that for right hand pages (the second argument of `\markboth{}` is not processed). In this combination, `aeven` and `aodd` are internally stored as `\leftmark` and `\rightmark`, respectively.

Once `\markboth{}` and `\markright{}` are finalized, they are associated with the marker commands of two different sectional units, where the marker commands are redefined through the `\renewcommand{ }[]{ }` command to implement the changes made. Two examples of redefining the marker commands `\chaptermark`, `\sectionmark`, and `\subsectionmark` are shown in Table 5.6 (each `\renewcommand{ }[]{ }`

Table 5.6 Redefining running header generating marker commands

Example	Redefinition of marker commands	Document-class
1	<pre>\renewcommand{\chaptermark}[1]% {\markboth{\chaptername~\thechapter. #1}{}} \renewcommand{\sectionmark}[1]% {\markright{\thesection. #1}}</pre>	book / report with twoside printing option
2	<pre>\renewcommand{\sectionmark}[1]% {\markboth{\thesection. #1}{}} \renewcommand{\subsectionmark}[1]% {\markright{\thesubsection. #1}}</pre>	article

is split into two lines as `\renewcommand{ }[]{ }` and `{ }` due to space limit). The `\chaptername` command generates the label-word `Chapter`, while `\thechapter`, `\thesection`, and `\thesubsection` generate the serial numbers of the current chapter, section and subsection, respectively. The syntax `[1]` means that there is one argument and the syntax `#1` is the location where the argument would be printed (in the current

examples, it might be the title of a sectional unit). The first `\renewcommand{ }{ }` command in example 1 would generate a running header on left hand pages something like ‘Chapter 1. Headers and Footers’, while the second `\renewcommand{ }{ }` command of this example would generate a header on right hand pages something like ‘1.2. Generating Headers’. The redefinitions given in Table 5.6 are default headers under the page style `headings` discussed in §5.3.1. To get the same headers under the page style `myheadings`, these redefinitions are to be put in the preamble of the input file of a document. Since the headers under the page style `myheadings` are user-defined, it is not necessary to use the exact redefinitions given in Table 5.6, but these can be customized as one wishes. For example, the `\chaptername` command in example 1 may be omitted if the label-word `Chapter` is not to be printed in the header, or the headers can be produced in boldface fonts by writing the arguments of `\markboth{ }` and `\markright{ }` through `\textbf{ }`, like `\markboth{\textbf{\thechapter. #1}}{ }` and `\markright{\textbf{\thesection. #1}}{ }`.

5.3.3 Header and Footer with the *fancy* Style Under the *fancyheadings* Package*

The page style `fancy`, defined in the `fancyheadings` package, allows very elegant customization of the running header and footer of a document. The package provides three types of headers as well as footers, through which a header/footer can be made page-wise left, center or right aligned, or even multiple pieces of headers and footers can be used. The commands for such headers and footers are shown in Table 5.7, where `podd` and `peven` are the contents of the headers/footers on odd and

Table 5.7 Commands for headers and footers under the `fancyheadings` package

Commands for headers	Commands for footers	Alignment
<code>\lhead[peven]{podd}</code>	<code>\lfoot[peven]{podd}</code>	Left
<code>\chead[peven]{podd}</code>	<code>\cfoot[peven]{podd}</code>	Center
<code>\rhead[peven]{podd}</code>	<code>\rfoot[peven]{podd}</code>	Right

even pages, respectively (optional `peven` becomes active only if `twoside` printing is opted). The line break command `\` can also be used to put a header/footer in multiple lines. However, in that case the values of `\headheight` and `\footskip` may need to be increased (refer Fig. 5.1 and Table 5.3).

In the `fancyheadings` package, provision is also there for drawing horizontal rules (lines) below the header and above the footer, whose thicknesses are controlled through the `\headrulewidth` and `\footrulewidth` commands, respectively. The default value of `\headrulewidth` is 0.4 pt, while that of `\footrulewidth` is 0 pt (making the rule above the footer invisible). The thickness of a rule can be altered through `\setlength{ }` (refer Table 5.3 for detail). Moreover, the headers, footers and their rules can also be extended to cover the marginal notes, by increasing the value

of their width controlling command `\headwidth` from `\textwidth` (default value) to `\textwidth+\marginparsep+\marginparwidth`.

The first three pages of a book chapter (the front page, an even page, and an odd page), designed through the page style `fancy` under the `fancyheadings` package, are shown in Table 5.8, where the line numbers in the L^AT_EX input file are shown for explanation purpose only. Two-side printing is opted in line 1 through the `twoside` option to `\documentclass[{}]`. The `fancyheadings` package is loaded in line 2 and the page style `fancy` is opted in line 4. The marker commands `\chaptermark` and `\sectionmark` are redefined in lines 5 and 6 through `\markboth{}` and `\markright{}`, respectively. The first argument of `\markboth{}` and the only argument of `\markright{}`, which in the

Table 5.8 Header and footer with the `fancy` page style under the `fancyheadings` package

L ^A T _E X input	<pre> 1 \documentclass[12pt,a4paper,twoside]{book} 2 \usepackage{fancyheadings} 3 % 4 \pagestyle{fancy} 5 \renewcommand{\chaptermark}[1]{\markboth{\thechapter. #1}} 6 \renewcommand{\sectionmark}[1]{\markright{\thesection. #1}} 7 \lhead[\textbf{\thechapter}]{\textbf{\rightmark}} 8 \rhead[\textbf{\leftmark}]{\textbf{\thechapter}} 9 \lfoot[\textbf{Engineering Mechanics}]{} 10 \rfoot[\textbf{Dilip Datta}]{} 11 \cfoot[]{} 12 \renewcommand{\headrulewidth}{0.15mm} 13 \renewcommand{\footrulewidth}{0.15mm} 14 \addtolength{\headwidth}{\marginparsep} 15 \addtolength{\headwidth}{\marginparwidth} 16 % 17 \begin{document} 18 ... 19 \chapter{Distributed Force System} 20 \thispagestyle{empty} 21 For simplifying an analysis, the force exerted by a body... 22 ... 23 \section{Centre of Gravity} 24 Since the weight of a body is a system of concurrent forces... 25 ... 26 \end{document} </pre>	<p style="text-align: center;">46</p> <p style="text-align: center;">4. Distributed Force System</p> <p style="text-align: center;">4.1 Centre of Gravity</p> <p>Since the weight of a body is a system of concurrent forces with the centre of the earth as the point of concurrency, the weight of the body can be represented by the resultant of the system of forces. The point on the body through which this resultant gravitational force passes is known as the centre of gravity of the body. The centre of gravity of a body can be obtained through a very simple experiment. Tie the body at a point by a string and hang it from a support. Then the body will be in equilibrium under the action of two equal, opposite and collinear forces, the weight of the body and the tension in the string. Mark the line of action of the forces by drawing a horizontal line of a small diameter. In this way get two or more lines by tying the body at different points. Interestingly, all the lines would be found passing through a single point, which is the centre of gravity of the body. Therefore, the centre of gravity of a body can be defined as the point through which the resultant of the elemental gravitational force of the body would pass regardless of the orientation of the body in the space. Since the distance between any two elements of a body is usually very very negligible in comparison with the distance from the body to the centre of the earth,</p>	<p style="text-align: center;">47</p> <p style="text-align: center;">4.1. Centre of Gravity</p> <p>It may be assumed that the elemental gravitational forces of the body are parallel to each other. Under this assumption, the centre of gravity of a body can be obtained mathematically by applying the principle of moment to a system of parallel forces, which would result the following coordinates for the centre of gravity of the body:</p> $\left(\bar{x} = \frac{\int x \, dW}{\int dW}, \bar{y} = \frac{\int y \, dW}{\int dW}, \bar{z} = \frac{\int z \, dW}{\int dW} \right) \quad (4.1)$ <p>Further, since any internal distance of a body is usually negligible in comparison with the distance from the body to the centre of the earth, it may be assumed that the gravitational field on the body is uniform, giving the same value of the gravitational acceleration, at every point of the body (i.e. $dW = \rho \, dV \, g$). Therefore, the coordinates of the centre of gravity, given by Eq (4.1), can be simplified as below:</p> $\left(\bar{x} = \frac{\int x \, dV}{\int dV}, \bar{y} = \frac{\int y \, dV}{\int dV}, \bar{z} = \frac{\int z \, dV}{\int dV} \right) \quad (4.2)$ <p>Since the coordinates of Eq (4.2) contain no reference to the gravitational field g, but only to the mass of the body, the centre of gravity can be termed as the centre of mass under the assumption of a uniform and parallel gravitational field.</p> <p style="text-align: right;">Dilip Datta</p>
Output	<p style="text-align: center;">Chapter 4</p> <p style="text-align: center;">Distributed Force System</p> <p>For simplifying an analysis, the force exerted by a body upon another body is usually treated as a point force acting at the point of contact of the bodies. In real world, no force acts at a point, but over a certain length, area or volume. This may be pertinent in the case of the force exerted on the pavement by a wheel of an automobile, particularly when we sit on a chair in the school. In this example, the force is distributed over the area of contact between the wheel and the pavement. A force distributed over a line can be found in a rope. A good example of a force distributed over a volume is the weight (gravitational force) of a body. The elemental gravitational force of each element of a body act towards the centre of the earth, i.e. the gravitational force of the entire body is a system of concurrent forces with the centre of the earth as the point of concurrency.</p>	<p style="text-align: center;">46</p> <p style="text-align: center;">4. Distributed Force System</p> <p style="text-align: center;">4.1 Centre of Gravity</p> <p>Since the weight of a body is a system of concurrent forces with the centre of the earth as the point of concurrency, the weight of the body can be represented by the resultant of the system of forces. The point on the body through which this resultant gravitational force passes is known as the centre of gravity of the body. The centre of gravity of a body can be obtained through a very simple experiment. Tie the body at a point by a string and hang it from a support. Then the body will be in equilibrium under the action of two equal, opposite and collinear forces, the weight of the body and the tension in the string. Mark the line of action of the forces by drawing a horizontal line of a small diameter. In this way get two or more lines by tying the body at different points. Interestingly, all the lines would be found passing through a single point, which is the centre of gravity of the body. Therefore, the centre of gravity of a body can be defined as the point through which the resultant of the elemental gravitational force of the body would pass regardless of the orientation of the body in the space. Since the distance between any two elements of a body is usually very very negligible in comparison with the distance from the body to the centre of the earth,</p>	<p style="text-align: center;">47</p> <p style="text-align: center;">4.1. Centre of Gravity</p> <p>It may be assumed that the elemental gravitational forces of the body are parallel to each other. Under this assumption, the centre of gravity of a body can be obtained mathematically by applying the principle of moment to a system of parallel forces, which would result the following coordinates for the centre of gravity of the body:</p> $\left(\bar{x} = \frac{\int x \, dW}{\int dW}, \bar{y} = \frac{\int y \, dW}{\int dW}, \bar{z} = \frac{\int z \, dW}{\int dW} \right) \quad (4.1)$ <p>Further, since any internal distance of a body is usually negligible in comparison with the distance from the body to the centre of the earth, it may be assumed that the gravitational field on the body is uniform, giving the same value of the gravitational acceleration, at every point of the body (i.e. $dW = \rho \, dV \, g$). Therefore, the coordinates of the centre of gravity, given by Eq (4.1), can be simplified as below:</p> $\left(\bar{x} = \frac{\int x \, dV}{\int dV}, \bar{y} = \frac{\int y \, dV}{\int dV}, \bar{z} = \frac{\int z \, dV}{\int dV} \right) \quad (4.2)$ <p>Since the coordinates of Eq (4.2) contain no reference to the gravitational field g, but only to the mass of the body, the centre of gravity can be termed as the centre of mass under the assumption of a uniform and parallel gravitational field.</p> <p style="text-align: right;">Dilip Datta</p>

present case are ‘\thechapter. #1’ and ‘\thesection. #1’, are internally stored in `\leftmark` and `\rightmark`, respectively (the second argument of `\markboth{ }{ }` is not processed as mentioned in §5.3.2 on page 42). Various headers and footers, as stated in Table 5.7, are defined in lines 7–11. The arguments of `\thead[]{ }` in line 7 print `\thepage` (page number) and `\rightmark` (information about `\section{ }`) as the left aligned headers on even and odd pages, respectively. Similarly, the arguments of `\rhead[]{ }` in line 8 print `\leftmark` (information about `\chapter{ }`) and `\thepage` (page number) as the right aligned headers on even and odd pages, respectively. Moreover, each of `\thepage`, `\rightmark`, and `\leftmark` is inserted as the argument of `\textbf{ }` for printing the corresponding contents in boldface fonts. On the other hand, values to the first argument of `\tfoot[]{ }` in line 9 and the second argument of `\rfoot[]{ }` in line 10 are supplied for printing their contents as the left aligned footer on even pages and right aligned footer on odd pages, respectively. No value is assigned to the arguments of `\cfoot[]{ }` in line 11 in order to keep the center footer blank, otherwise the page number will be printed here also. The `\renewcommand{ }{ }` command in lines 12 and 13 assigns the value of 0.15mm to each of `\headrulewidth` and `\footrulewidth` for obtaining rules, each of thickness 0.15 mm, below the header and above the footer, respectively. Moreover, `\addtolength{ }{ }` is used in lines 14 and 15 for adding the values of `\marginparsep` and `\marginparwidth` to the default value of `\headwidth`, which is done for increasing the horizontal widths of the header, footer and rules to cover the marginal notes also. Finally, `\thispagestyle{empty}` is inserted just after each `\chapter{ }` (shown in line 20) to avoid numbering of the first page of a chapter, otherwise `\thispagestyle{plain}` (by default associated with `\chapter{ }`) will print the page number as the center footer on the first page of each chapter.

5.3.4 Header and Footer with the fancy Style Under the fancyhdr Package*

Similar to the `fancyheadings` package, there is `fancyhdr` package that also defines the `fancy` page style¹. The header and footer commands under the `fancyhdr` package are slightly different than those under the `fancyheadings` package. For obtaining the same style (as shown in Table 5.8) under the `fancyhdr` package, the commands of lines 7–11 in Table 5.8 are to be replaced by the six lines of commands given in Table 5.9.

Table 5.9 Header and footer with the `fancy` page style under the `fancyhdr` package

LaTeX input	1	<code>\fancyhead[le,ro]{\textbf{\thepage}}</code>
	2	<code>\fancyhead[re]{\textbf{\leftmark}}</code>
	3	<code>\fancyhead[lo]{\textbf{\rightmark}}</code>
	4	<code>\fancyfoot[le]{\textbf{Engineering Mechanics}}</code>
	5	<code>\fancyfoot[ro]{\textbf{Dilip Datta}}</code>
	6	<code>\fancyfoot[c]{ }</code>

¹The header style under the `headings` page style is predefined, while the header/footer styles under the `myheadings` and `fancy` page styles are user-defined.

The `\fancyhead[{}]` and `\fancyfoot[{}]` are, respectively, the commands for headers and footers, whose **l**, **c**, and **r** options stand for left, center, and right aligned header/footer, while **o** and **e** mean odd and even numbered pages, respectively. Accordingly, the combinations **lo** and **le** stand for left alignment on odd and even numbered pages, respectively, while **ro** and **re** mean right alignment on those pages. If no choice is supplied for alignment, headers/footers will be printed in all the three positions (left, center, and right). Similarly, if no choice is supplied for pages, a header/footer will be printed on both odd and even numbered pages. On the other hand, if none of alignment and page is provided, headers/footers will be printed in all the three alignments on both odd and even numbered pages.

5.4 Page Breaking and Adjustment

The application of the `\nopagebreak` command at a point prevents the page breaking at that point. On the other hand, the `\newpage`, `\pagebreak`, `\clearpage`, or `\cleardoublepage` command may be used for printing the remaining contents of a document on a new page by breaking the current page at the point where the command appears. In the case of **twoside** option to `\documentclass[{}]`, `\cleardoublepage` prints the remaining materials of a document from the next odd numbered (right hand) page, even by leaving the previous even numbered (left hand) page blank, if required. In a multi-column page, the `\newpage` and `\pagebreak` commands start a new column instead of a new page. In that case, a new page can be started using `\clearpage` or `\cleardoublepage` only.

The `\raggedbottom` declaration in the preamble puts texts from the top of a page, leaving extra space at the bottom if no material is available to put in that limited space. The `\raggedbottom` declaration is default, except under the **twoside** option to `\documentclass[{}]`. In contrary, the `\flushbottom` declaration makes all pages of the same height adding extra vertical space, if required². Even when `\flushbottom` is in effect, `\newpage` may be used to produce a shortened page (i.e., like `\raggedbottom` page).

5.5 Page Numbering

As seen in Table 1.2 on page 4, by default L^AT_EX assigns a page number in Arabic numeral at the bottom-center of every page, starting with 1 from the very first page of a document. Other numbering styles can be obtained by manual setting, either

²The `\raggedbottom` declaration (default except **twoside** option to `\documentclass[{}]`) puts texts from the top of a page leaving extra space at the bottom if required, while the `\flushbottom` declaration makes all pages of the same height adding extra vertical space if required.

for all pages or for selective pages of a document. A few such styles are explained below:

1. Five types of page numbering are available, which are listed in Table 5.10³.

Table 5.10 Different types of page numbering

Type of numbering	Meaning
arabic	Arabic numerals, like 1, 2, ...
roman	Lowercase Roman numerals, like i, ii, ...
Roman	Uppercase Roman numerals, like I, II, ...
alph	Lowercase English alphabets, like a, b, ...
Alph	Uppercase English alphabets, like A, B, ...

A particular type of numbering can be obtained through `\pagenumbering{anum}`, where `anum` is the required type of numbering as shown in Table 5.10, e.g., `\pagenumbering{alph}` for numbering pages by lowercase English alphabets. The effect would be global if `\pagenumbering{}` is put in the preamble. For local effect, the command can be put inside the `document` environment also, e.g., numbering the pages of the front matter of a book by lowercase Roman numerals, while those of the main matter and back matter by Arabic numerals. If `\pagenumbering{}` is put somewhere inside the `document` environment, the previous numbering style will be altered with effect from the current page onward. Whenever `\pagenumbering{}` is used, the counter of the pages is reset to unity starting from the page containing the command. For effective local implementation, `\pagenumbering{}` should be preceded by one of the `\newpage`, `\clearpage` and `\cleardoublepage` commands, which will terminate the current page and print the remaining materials of a document starting from the next page.

2. By default page numbering starts from unity. Numbering can be started from any other number using `\setcounter{page}{n}` in the preamble, where `n` (an integer) is the desired starting page number of the document.
3. The `\thispagestyle{empty}` command may be used on a page to avoid it from numbering (although the page will not be numbered, it will be counted while numbering the following pages). This may be useful in a report, where number is not to be shown on the first page. If a page is not to be numbered as well as not to be counted, the `\setcounter{page}{n}` command with appropriate value of `n` may be used at the starting of the next page.
4. If none of the pages of a document is to be numbered, the `\pagestyle{empty}` or the `\let\thepage\relax` command may be used in the preamble.

³Five types of numbering of pages and numbered units are **arabic**, **roman**, **Roman**, **alph**, and **Alph**.