PAPER *Special Issue on LaTeX 2ε Class File for the IEICE Transactions*

How to Use the Class File (ieice.cls) for the IEICE Transactions**

Hanako DENSHI†, ***Member and*** **Taro DENSHI**††*, ***Nonmember***

SUMMARY IEICE (The Institute of Electronics, Information and Communication Engineers) provides a LaTeX 2ε class file, named ieice.cls, for the IEICE Transactions. This document describes how to use the class file, and also makes some remarks about typesetting a manuscript by using the LaTeX 2ε. The design is based on LaTeX 2ε.

key words: *LaTeX 2ε class file, typesetting, math formulas*

1. Introduction

This document describes how to handle the ieice.cls for the IEICE (the Institute of Electronics, Information and Communication Engineers) Transactions. Section 2 explains how to typeset according to the template. template.tex which is distributed with the ieice.cls can be used. Section 3 describes a special feature of ieice.cls, which is different from the article.cls provided by the standard LaTeX 2ε and which points may be aware of on writing a manuscript and so on. Section 4 is about typographic notes, which explains how to typeset, how to prevent typographic errors and how to handle long formulas.

2. Template and How to Typeset a Manuscript

ieice.cls should be specified as a document class, not as an option. The layout is influenced with the following formatting request, twocolumn, twoside and fleqn, which are declared inside the class file. There is no need to specify them as an option again and other options changing the layout or all style parameters should not be specified.

2.1 The Class Option and The Option for Initial Submission

Information for Authors (Brief Summary) says that each submitted manuscript is categorized as either "PAPER" or "LETTER". ieice.cls provides options of \documentclass for not only "PAPER" and "LETTER" but also "INVITED PAPER", "SURVEY PAPER", ... and "initial submission" shown in Table 1.

Manuscript received January 15, 1999.
Manuscript revised November 27, 2002.
Final manuscript received October 29, 2003.
†The author is with the Faculty ...
††The author is with the Faculty ...
*Presently, the author is with ...
**This paper was presented at ...

Table 1 Options of \documentclass.

class option	manuscript type
referee	initial submission (typeset in one column)
paper	PAPER
invited	INVITED PAPER
survey	SURVEY PAPER
invitedsurvey	INVITED SURVEY PAPER
review	REVIEW PAPER
tutorial	TUTORIAL PAPER
letter	LETTER

With no optional arguments to \documentclass, ieice.cls will be formatted in "PAPER" style.

Once the referee option is specified, a manuscript will be formatted in one column. This option is provided for initial submission. It might save author(s) a lot of time to fold long math formulas.

When letter is specified, the author's profile (the \profile command, see page 3) at the end of a manuscript will not be produced.

2.2 Template

Here is the template.

```
\documentclass[paper]{ieice}
%\documentclass[referee]{ieice}
%\documentclass[invited]{ieice}
%\documentclass[survey]{ieice}
%\documentclass[invitedsurvey]{ieice}
%\documentclass[review]{ieice}
%\documentclass[tutorial]{ieice}
%\documentclass[letter]{ieice}
\usepackage[dvipdfm]{graphicx}
\usepackage{latexsym}
\setcounter{page}{1}
\field{A}
\vol{86}
\no{5}
\SpecialIssue{\LaTeXe\ Class File
              for the IEICE Transactions}
%\SpecialSection{}
\title[How to Use the Class File]
      {How to Use the Class File
       for the IEICE Transactions}
\titlenote{This paper was presented at ...}
\authorlist{%
 \authorentry{Hanako DENSHI}{m}{labelA}
```

```
 \authorentry{Taro DENSHI}{n}{labelB}[labelC]
}
%\breakauthorline{2}
\affiliate[labelA]
 {The author is with the Faculty ...}
\affiliate[labelB]
 {The author is with the Faculty ...}
\paffiliate[labelC]
 {Presently, the author is with ...}

\received{1999}{1}{15}
\revised{2002}{11}{27}
\finalreceived{2003}{10}{29}

\begin{document}
\maketitle

\begin{summary}
IEICE (The Institute of Electronics,
Information and Communication Engineers)
provides a \LaTeXe\ class file,
named \ClassFile, for the IEICE Transactions.
 ...
\end{summary}
\begin{keywords}
\LaTeXe\ class file, typesetting,
math formulas
\end{keywords}
\section{Introduction}
 ... ... ...
\section*{Acknowledgments}
 ... ... ...
\bibliographystyle{ieicetr}
\bibliography{myrefs}
\begin{thebibliography}{9}
\bibitem{}
\end{thebibliography}

\appendix
%\appendix*
 ... ... ...
\profile{Taro Denshi}{was born in 19xx. ...}
\end{document}
```

- The `\field` command is required by the header. Its argument indicates the categories of Transactions (see following table). For example, in the case of "Fundamentals", `A` is specified as an argument of `\field`.

`A`	Fundamentals
`B`	Communications
`C`	Electronics
`D`	Information and Systems

- The `\vol` and `\no` commands are not needed to be assigned in submitted manuscript (there are no entries of them in `template.tex`). They are required by the header, which needs information of volume and number of issue in final printing, and are assigned as `\vol{86} and \verb/` respectively. Both arguments must be a positive integer.
- The `\SpecialIssue` and `\SpecialSection` commands are required in the case of submission to the Special Issue (Special Section) described on Call for Papers, not in the case of the Regular Issue (Regular Section). An argument description is as follows.

  ```
  \SpecialIssue{Image Processing}
  ```

- The title of a manuscript is assigned in `\title`. You may use `\\` to start a new line in a long title. The argument of the `\title` command is required for more than just producing a title, it is also required to generate a running head, combining with authors' names. If you want a shorter title for a running head, type as follows.

  ```
  \title[short title]{title}
  ```

- If you need to describe a notation when a manuscript was first reported and by which organization authors were supported, etc., the `\titlenote` command can be used.
- The outputs of authors' names, membership status and marks of affiliates are automatically generated by using the `\authorlist` and `\authorentry` commands.
  The `\authorentry` command must be described as an argument of the `\authorlist` command. The `\authorentry` command has three arguments.

  ```
  \authorentry{name}{membership}{label}
  ```

  For example, they could be typed as follows.

  ```
  \authorlist{
  \authorentry{Hanako DENSHI}{m}{labelA}
  \authorentry{Taro DENSHI}{n}{labelB}
  }
  ```

  - The first argument of `\authorentry` is filled with an author's name. The family name should be described in uppercase letters.
  - The second argument is specified by one letter out of five letters (m, n, a, s, h, f), each one indicating the membership status of each author as the following table shows.

`m`	Member
`n`	Nonmember
`a`	Affiliate Member
`s`	Student Member
`h`	Fellow, Honorary Member
`f`	Fellow

the left column is letters to be specified. the right column is membership status to be generated.

To specify other letters will not cause errors, but will cause wrong output. No extra spaces may be added between a letter and a brace. {m} and {m␣} are regarded as different. The latter will not generate "Regular Member".

– The third argument is assigned by the label of the author's affiliate, corresponding to the label of the \affiliate command (see below). For example, an abbreviation for a university, institute or company is recommended for the label.
In the case of no affiliate, the label none must be specified. And in the case of plural affiliates, labels should be specified as a comma separated list.

- E-mail addresses might be specified. Its description is as follows.

```
\authorentry[name@xx.yy.zz]
{Hanako DENSHI}{m}{labelA}
```

- If you need to inform a present affiliate, the optional fourth argument of \authorentry can be used as follows.

```
\authorentry{Hanako DENSHI}{m}{labelA}
[lableB]
```

The fourth argument which is described in brackets is corresponding to the label of the \paffiliate command (see below).

- The \breakauthorline command is provided, if you would like to break a line of author's lists at any point.
\breakauthorline{*num,num,num,...*}
num must be a positive integer. If "3" is specified, the line-break will be occurred after the third author. If "2,4,6" is specified, line-breaks will be occurred after the second, fourth and sixth authors.
- Author's affiliate is described in the \affiliate command as follows.

```
\affiliate[label]{affiliate}
```

The first argument label must be the same as the 3rd argument of the \authorentry command. No extra spaces may be added between a letter and a brace. The second argument is filled with the author's affiliate.
The entry of \affiliate must be put in the same order as labels of \authorentry lists.
If the labels of affiliate are different from those of \authorentry, there will come a warning message on your terminal.
- The author's present affiliate is described in the \paffiliate command as follows.

```
\paffiliate[label]{present affiliate}
```

The first argument must be the same as the fourth argument of \authorentry command.

- The \received, \revised and \finalreceived commands are required to generate the date of receipt of a manuscript, revision of a manuscript and the date of final version. Those descriptions is in the order of year/month/day. For example, the date of receipt is assigned as \received{1999}{1}{15}.
Notice that the \finalreceived command could be only required when a manuscript would be submitted in Trans. on Fundamentals (A).

All those commands should be written in preamble.

The \maketitle command should be placed after the \begin{document} command. It generates the title.

- The text of the abstract is described in the summary environment. It should be about 300 words for a "PAPER", 50 for a "LETTER" in a single paragraph.
- The text of the keywords is described in the keywords environment. The text should be 4–5 words and be given in lowercase letters except abbreviations and proper nouns.
- If you might express your gratitude, the following description is recommended.

```
\section*{Acknowledgments}
```

- The \appendix command provided by the standard LaTeX 2_ε is only a declaration that changes the way sectional units are numbered. But \appendix and \appendix* commands provided by ieice.cls are different from it.
Once the \appendix command is declared, the following \section commands will generate "Appendix A: ", "Appendix B: ", ... On the other hand, the \appendix* command will generate "Appendix: " without sectional numbers. So the latter should be used when the appendix has no more than one section.
Once either of both commands is declared, equation numbers and float numbers are numbered "A· 1", "A· 2", ...
- Authors' biographies (not necessary for a "LETTER") on page 8 are generated with:

```
\profile{Hanako Denshi}
{was born in 19xx.
...
The Institute of Electronics,
Information and Communication
Engineers (IEICE), ...}
```

– The first and second arguments are filled with an author's name and profile respectively.
– If EPS (see page 4) files of pictures of the authors' faces are provided, put the EPS files named a1.eps, a2.eps, etc., which are followed

by the order of authors, on the current directory of your computer. The `\profile` command automatically reads their files and puts their pictures on the left margin.
`graphics` or `graphicx` package must be specified.
The ratio of EPS file must be width : height = 25 : 33. EPS files will be read by the following command.

```
\resizebox{25mm}{!}
{\includegraphics{a1.eps}}
```

If their files don't exist in the current directory, simple frames will be generated (see page 8).

Pictures of the authors' faces may be omitted by using the `\profile*` command instead of the `\profile` command.

3. Special Feature of `ieice.cls` and Notes about Some Features of LaTeX 2ε

3.1 Formula

As described in Sect. 2, the `fleqn` option is in effect. A displayed formula is aligned on the left, a fixed distance (7 mm) from the left margin, instead of being centered. A formula number is put on the right side.

Although a width of one column might be felt too narrow to compose displayed formulas, equations should be composed with the proper length, paying attention to the message "`Overfull \hbox`". Section 4.2 describes several solutions and hints to hande a long formula.

3.2 Figures and Tables

The font size inside the `figure` and `table` environments is set `\footnotesize` (8 pt) (see Table 2).

The `[h]` option, one of the arguments of floating environment specifying a location where the float may be placed, is not recommended. Figures and tables should be located at the top or bottom of a page by using `[tb]` or `[tbp]`.

Table 2 The font size in the `table` environment is 8 point.

A	B	C
X	Y	Z

```
\begin{table}[b]?[tbp]
\caption{An example of table.}
\label{table:1}
\begin{center}
\begin{tabular}{c|c|c}
\hline
A & B & C\\
\hline
X & Y & Z\\
\hline
\end{tabular}
\end{center}
\end{table}
```

3.2.1 Including Graphics

Although there are many ways to include pictures and figures in LaTeX, the Encapsulated PostScript format (EPS) is recommended.

Here is a simple explanation to insert graphics into a manuscript.

The `graphics` or `graphicx` package must be loaded. The option `dvips` is one of the device driver's option, it might be changed according to a device driver you use or might be omitted.

```
\usepackage[dvipdfm]{graphicx}
```

A graphics file (EPS file) produced by another program can be included with the `\includegraphics` command.

```
\begin{figure}[tb]
\begin{center}
\includegraphics{file.eps}
\end{center}
\caption{...}
\label{fig:1}
\end{figure}
```

If the option `scale=0.5` is given, the graphics will be scaled by half.

```
\includegraphics[scale=0.5]{file.eps}
```

You can get the same result as above by using the `\scalebox` command.

```
\scalebox{0.5}{\includegraphics{file.eps}}
```

If the option `width=30mm` is given, the width of graphics will be 30 mm (with the height proportionally scaled).

```
\includegraphics[width=30mm]{file.eps}
```

The next is another example using `\resizebox`.

```
\resizebox{30mm}{!}
 {\includegraphics{file.eps}}
```

Both dimension of width and height can be specified as follows.

```
\includegraphics[width=30mm,height=40mm]
 {file.eps}
```

or

```
\resizebox{30mm}{40mm}
 {\includegraphics{file.eps}}
```

For further information about the graphics package, see reference book [7], [9].

```
\begin{figure}[tbp]
... floating materials ...
\capwidth=50mm
\caption{An example of figure.
\label{fig:1}
\end{figure}
```

Fig. 1 An example of figure

3.2.2 Captions of Floating Environment

`ieice.cls` set the width of caption to `\columnwidth` (about 83.5 mm) in the case of single column and 0.66`\textwidth` (about 116 mm) in the case of double column.

The width of caption can be set by changing the value of `\capwidth` (see Fig. 1).

3.3 Theorem-like Environment

If you use the `\newtheorem` environment, pay attention to the following points. Additional vertical spaces before and after the environment are `.5\baselineskip`, and the text within the environment does not appear in italics.

An example is given as follows.

```
\newtheorem{theorem}{Theorem}
\begin{theorem}[Fermat]
There are no positive integers such that
$x^n + y^n = z^n$ for $n>2$.
I've found a remarkable proof of this fact,
but there is not enough space
in the margin [of the book] to write it.
(Fermat's last theorem).
\end{theorem}
```

Theorem 1 (Fermat): There are no positive integers such that $x^n + y^n = z^n$ for $n > 2$. I've found a remarkable proof of this fact, but there is not enough space in the margin [of the book] to write it. (Fermat's last theorem).

3.4 Footnotes

The footnote begins with "†" (see page 7). As the footnote counter increases, the footnote marks proceed as "†", "††", "†††". The footnote mark is set to reset at each page.

3.5 Bibliography and Citations

The bibliographic reference list should be generated according to the IEICE editing style, e.g., authors' initials, names, title of article, journal abbreviation, volume, number, pages, and publication year, etc. Information about composing such lists can be given in "Information for Authors (Brief Summary)" and the following web site.

`http://www.ieice.org/eng/shiori/mokuji.html`

On the other hand, in case using BibTeX [5] the bibliography style `ieicetr.bst` (numeric citation order) is recommended, which is distributed with `ieice.cls`.

`ieice.cls` includes the `citesort` package with a slight modification. The `citesort` package collapses a list of three or more consecutive numbers into a range, and sorts the numbers before collapsing them. For instance, while the following example, `\cite{FMi1,FMi2,FMi3,latexbook,texbook, Salomon}`, would produce [5, 9, 10, 7, 1, 8] in the standard style, it is transformed into "[1], [5], [7]–[10]" in this class file.

3.6 Verbatim Environment

You can change the values of the parameters in the verbatim environment which is customized in `ieice.cls`. The default settings are:

```
\verbatimleftmargin=0pt
\def\verbatimsize{\normalsize}
\verbatimbaselineskip=\baselineskip
```

For example, those parameters can be changed as follows.

```
\verbatimleftmargin=7mm
\def\verbatimsize{\footnotesize}
\verbatimbaselineskip=3mm
```

3.7 AMS Packages

The $\mathcal{AMS}$-LaTeX packages are provided to typeset complex equations or other mathematical constructions. If you would like to use them, the `amsmath` package should be loaded with the `fleqn` option.

```
\usepackage[fleqn]{amsmath}
```

While the `amsmath` package presents many functions, the `\boldsymbol` command which is to be used for individual bold math symbols and bold Greek letters is needed, only the `amsbsy` package might be loaded.

```
\usepackage{amsbsy}
```

Once the `amssymb` package is loaded, many extra math symbols of the $\mathcal{AMS}$-LaTeX fonts will become available.

```
\usepackage{amssymb}
```

For further information about the $\mathcal{AMS}$-LaTeX package, see reference book [5].

Table 3 `\RN` and `\FRAC`

`\RN{2}`	`\RN{117}`	`\FRAC{$\pi$}{2}`	`\FRAC{1}{4}`
II	CXVII	$\pi/2$	$1/4$

3.8 Miscellaneous

The following macros are defined in `ieice.cls`.

- `\QED`: Produces "□" in the end of the proof and so on. You would get the same output by using `\hfill $\Box$`. But if the end of a paragraph goes to the right margin, the character □ is positioned at the start of a line. Using `\QED` will prevent such a case.
  Notice that the `latexsym` package is required to produce □.
- `\halflineskip` and `\onelineskip`:
  Produce a vertical space, `0.5\baselineskip`, `1\baselineskip` respectively.
- `\RN` and `\FRAC`: Are shown in Table 3 [1].
- `\ddash`: Produce double "—". Double "`---`" sometimes produce thin space between two "—". `\ddash` will prevent such a case.

4. Typographic Notes

4.1 How to Prevent Typographic Errors

1. "The italic correction will be automatically added by the font commands with arguments but must be inserted manually using `\/` when declarations are used" [5].
   `{\itshape italic\/}`:
   italic correction is required.
   `\textit{italic}`:
   italic correction is not required.
2. You should pay attention to a space after a period. "TEX simply assumes that a period ends a sentence unless it follows an uppercase letter. This works most of the time, but not always—abbreviations like 'etc.' being the most common exception. You tell TEX that a period doesn't end a sentence by using a `\␣` command (a `\` character followed by a space or the end of a line) to make the space after the period."
   "On the rare occasions that a sentence-ending period follows an uppercase letter, you will have to tell TEX that the period ends the sentence. You do this by preceding the period with a `\@` command" [7].
   `Beans (lima, etc.)\ have vitamin B\@.`
3. "Line breaking should be prevented at certain interword spaces. ... Trying `~` (a tilde character) produces an ordinary interword space at which TEX will never break a line" [7].
   `Mr.~Jones`, `Figure~\ref{fig:1}`, `(1)~gnats`.
4. With respect to Figure, Section, Equation, when these words appear at the beginning of a sentence, they should be spelt out in full, e.g., "Figure 1 shows ..." is used. When they appear in the middle or the last of a sentence, abbreviations, e.g., "in Fig. 1", "in Sect. 2", "in Eq. (3)" should be used.
5. There should be no space after opening or before closing parentheses, as in `(␣word␣)`.
6. There are many cases of an inappropriate application of a `\\` or `\newline` command except in the tabular environment etc., such as two `\\` commands in succession or `\\` command just before a blank line. They will often cause warning messages like `Underfull \hbox` ..., as a result it would often prevent you from finding important warning messages. The use of `\par\noindent` or `\hfil\break` commands is recommended and gives you the same effect without warning messages.
7. There are some cases of an inappropriate application of a `\\` in descriptions such as program lists. Use of the `tabbing` environment or `list` environment is recommended.
8. There are three types of dashes that are used. The hyphen (`-`) is used in connecting English-language words such as 'well-known', and the en dash (`--`) is used when expressing a range such as 'pp.298–301'. The em dash (`---`) is even longer—it's used as punctuation.
9. Notice that LATEX recognizes the hyphen and en dash in math mode as the minus sign. Use `\hbox` or `\mbox` if you would like to use the hyphen and en dash in math mode as it is. Some examples are given below.
   `$A^{b-c}$`
   A^{b-c} ⇒ minus sign
   `$A^{\mathrm{b}\mbox{\scriptsize -}\mathrm{c}}$`
   $A^{\mathrm{b}\mbox{\scriptsize -}\mathrm{c}}$ ⇒ hyphen
   `$A^{\mathrm{b}\mbox{\scriptsize --}\mathrm{c}}$`
   $A^{\mathrm{b}\mbox{\scriptsize --}\mathrm{c}}$ ⇒ en dash
   `$A^{\mathrm{b-c}$`
   $A^{\mathrm{b-c}}$ ⇒ minus sign
10. The less-than sign "<" (`<`, a relation) should not be confused with "⟨" (`\langle`, a delimiter). The same is true for the greater-than sign ">" and "⟩".
11. A unary operator and a binary operator: "A + or − that begins a formula (or certain subformulas) is assumed to be a unary operator, so typing `$-x$` produces $-x$ and typing `$\sum - x_{i}$` produces $\sum -x_i$, with no space between the "−" and "x". If the formula is part of a larger one that is being split across lines, TEX must be told that the + or − is a binary operator. This is done by starting the formula with an invisible first term, produced by an `\mbox` command with a null argument" [7].

```
\begin{eqnarray}
y &=& a + b + c + ... + e\\
& & \mbox{} + f + ...
\end{eqnarray}
```

12. `\allowbreak` may be used within long math formulas in paragraphs since TEX is reluctant to break lines there. It allow a line or page break where one could not ordinary occur. On the other hand, `\\`, `\hfil\break` an `\linebreak` force TEX to break a line at the point.

4.2 How to Handle Long Formulas

Here are some explanations how to handle long formulas, for example, overhanged equations, equations overriding the equation number, and so forth.

Example 1:

$$y = a+b+c+d+e+f+g+h+i+j+k+l+m \quad (1)$$

The above equation is too long, and the space between the equation and the equation number are too narrow and sometimes the equation number would moves to the right. In this case the `\!` command is useful.

"The `\!` acts like a backspace, removing the same space amount of space that `\,` adds" [7].

```
\begin{equation}
y\!=\!a\!+\!b\!+\!c\!+\! ... \!+\!m
\end{equation}
```

$$y=a+b+c+d+e+f+g+h+i+j+k+l+m \quad (2)$$

Example 2: Using `eqnarray` environment instead of `equation` environment.

```
\begin{eqnarray}
y &=& a+b+c+d+e+f+g+h\nonumber\\
& & \mbox{}+i+j+k+l+m
\end{eqnarray}
```

To typeset above, you will get the following output.

$$\begin{aligned} y &= a+b+c+d+e+f+g+h \\ &\quad +i+j+k+l+m \end{aligned} \quad (3)$$

Example 3: Changing the value of `\mathindent` is to change the position that the equation begins[†].

```
\mathindent=0mm ? <-- [A]
\begin{equation}
y=a+b+c+d+e+f+g+h+i+j+k+l+m
\end{equation}
\mathindent=7mm ? <-- [B] default value
```

[†]This explanation is appropriate to left-aligns displayed formulas, not to centering formulas.

To typeset above (notice `[A]`), you will get the following output.

$$y = a+b+c+d+e+f+g+h+i+j+k+l+m \quad (4)$$

The value of `\mathindent` must be restored (notice `[B]`).

Example 4:

$$\iint_S \left(\frac{\partial V}{\partial x} - \frac{\partial U}{\partial y}\right) dxdy = \oint_C \left(U\frac{dx}{ds} + V\frac{dy}{ds}\right) ds \quad (5)$$

The above equation is too long and almost overrides the equation number. In this case the `\lefteqn` command is useful. It can be used for splitting long formulas across lines as follows.

```
\begin{eqnarray}
\lefteqn{
\int\!\!\!\int_S
\left(\frac{\partial V}{\partial x}
-\frac{\partial U}{\partial y}\right) dxdy
}\quad\nonumber\\
&=& \oint_C \left(U \frac{dx}{ds}
+ V \frac{dy}{ds} \right)ds
\end{eqnarray}
```

To typeset above, you will get the following output.

$$\begin{aligned} &\iint_S \left(\frac{\partial V}{\partial x} - \frac{\partial U}{\partial y}\right) dxdy \\ &= \oint_C \left(U\frac{dx}{ds} + V\frac{dy}{ds}\right) ds \end{aligned} \quad (6)$$

Example 5: A matrix which is typed by using the `array` environment.

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix} \quad (7)$$

The width of a matrix can be shrunk by changing the value of `\arraycolsep` or using an `@`-expression (`@{}`).

```
\begin{equation}
\arraycolsep=3pt ?     <--- [C]
A = \left(
\begin{array}{@{\hskip2pt}??  <-- [D]
cccc
@{\hskip2pt}??  <-- [D]
}
a_{11} & a_{12} & \ldots& a_{1n} \\
a_{21} & a_{22} & \ldots& a_{2n} \\
\vdots& \vdots& \ddots& \vdots\\
a_{m1} & a_{m2} & \ldots& a_{mn} \\
\end{array}
\right)
\end{equation}
```

The `\arraycolsep` dimension is half the width of a horizontal space between columns in the `array` environment. A matrix typed by using the `array` environment can be shrunk by changing the value of `\arraycolsep` (notice `[C]`). And also it can be shrunk by using `@`-expression (notice `[D]`).

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix} \tag{8}$$

Compare Eqs. (7) and (8).

Example 6: A matrix which is typed by using a `\pmatrix`.

```
\begin{equation}
 \def\quad{\hskip.75em\relax}% <-- [E]
 %% default setting is \hskip1em
 A = \pmatrix{
       a_{11} & a_{12} & \ldots & a_{1n} \cr
       a_{21} & a_{22} & \ldots & a_{2n} \cr
       \vdots & \vdots & \ddots & \vdots \cr
       a_{m1} & a_{m2} & \ldots & a_{mn} \cr
     }
\end{equation}
```

In the case of the equation typed by using `\pmatrix`, the definition of `\quad` can be changed (notice `[E]`).

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix} \tag{9}$$

Notice that if `amsmath` packages is loaded you must use the `pmatrix` environment instead of `\pmatrix`. In that case, the explanation on Example 5 is useful.

If any of the above explanations could not resolve the problem, there might be the following method, surrounding a display environment with `small` or `footnotesize`, scaling a part or all of a formula by using `\scalebox`, inserting a display environment into a float environment.

5. Submission of Final Data

Information about the submission of the final data can be given in "Information for Authors (Brief Summary)" and the following web site.
`http://www.ieice.org/eng/shiori/mokuji.html`

- A source file should constitute a single file. A `bbl` file produced by BibTeX should be include in a main source file.
- Source files required for compilation, such as the original macro file created by authors, special macro files, etc. must be submitted.

References

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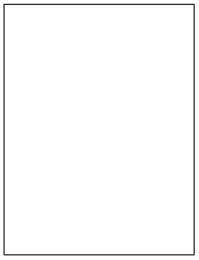
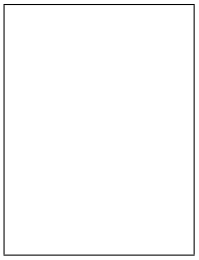
Appendix: Omitted Commands

Some commands which is not required by `ieice.cls` are omitted. These commands are `\tableofcontents`, `\titlepage`, `\part`, `\theindex`, `headings` and the related commands.



Hanako Denshi was born in 19xx. ... The Institute of Electronics, Information and Communication Engineers (IEICE), Kikai-Shinko-Kaikan Bldg., 5–8, Shibakoen 3-chome, Minato-ku, Tokyo, 105–0011 Japan.



Taro Denshi was born in 19xx. ... The Institute of Electronics, Information and Communication Engineers (IEICE), Kikai-Shinko-Kaikan Bldg., 5–8, Shibakoen 3-chome, Minato-ku, Tokyo, 105–0011 Japan.