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IEE Japan provides a $\square T_E X 2_{\varepsilon}$ class file, named ieej-e.cls, for the Transactions of the Institute of Electrical Engineers of Japan. This document describes how to use the class file, and also makes some remarks about typesetting a document by using $\square T_E X 2_{\varepsilon}$. The design is based on $\square T_E X 2_{\varepsilon}$.

Keywords: Class file, IAT_EX $2_{\mathcal{E}}$

1. Introduction

This document describes how to handle the ieej-e.cls for the Transactions of the Institute of Electrical Engineers of Japan. Section 2 explains how to typeset according to the template. template.tex which is distributed with the ieej-e.cls can be used. Section 3 describes a special feature of ieej-e.cls, which is different to the article.cls provided by the standard IATEX 2_{ε} and which points may be aware of on writing a paper 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. For information about printing on A4 paper and making pdf file, see Appendix (p.6).

2. Template and How to Typeset the Paper and Letter

2.1 Type of the Paper Here is the template of the paper.

```
\documentclass[english]{ieej-e}
\usepackage{graphicx}
\usepackage[varg]{txfonts}
FIELD{A}
YEAR{2024}
NO{1}
\title[]{title}
\authorentry{name}{membership}{label}
\affiliate[label]
\{affiliate \setminus address\}
\cline{2023}{11}{24}
\ensuremath{\{2024\}}\{2}\{9}
\begin{document}
\begin{abstract}
Summary
\end{abstract}
```

\begin{keyword}
Keywords
\end{keyword}
\maketitle
\section{Introduction}
...
\begin{thebibliography}{99}
\bibitem{}
...
\end{thebibliography}
\appendix
\section{}
...
\acknowledgment

- \begin{biography}
- $\operatorname{profile}\{\operatorname{membership}\{\operatorname{name}\}\{\operatorname{text}\}$

\end{biography}

```
\end{document}
```

- The txfonts package should be loaded. \usepackage[varg]{txfonts} Note that if you require amsmath packages, it must be specified before txfonts package.
- The \FIELD command is used for the footer. Its argument indicates the categories of IEEJ transactions (see Table 1 of "Author's Guidelines for the Transactions of the Institute of Electrical Engineers of Japan"). For example, in the case of "Fundamental and Materials" A is specified as the argument of \FIELD.
- The \YEAR command is used for the footer. The year of publication is assigned as \YEAR{2011}.
- The \NO command is also used for the footer. The number of the issue is assigned as $\NO{1}$.
- Those two commands are optional. If you do not know which issue your paper to be appear, they may be commented out or left blank.
- The title of a paper is assigned in \title. You may use \\ to start a new line in a long title.

The argument of the \title command is used for more than just producing a title, it is also used to

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generate a running head.

A shorter title should be specified within 8 words as follows.

\title[short title]{title}

• The outputs of authors' names, memberships 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 typesetted as follows: authorlist %

```
\authorentry{Taro⊔Denshi}{m}{TRL}
```

\authorentry{Hanako⊔Denki}{n}{KEC}

- }
- \circ The first argument of **\authoremsty is filled** with the author's name.
- The second argument is specified by one letter out of seven letters (m, a, s, l, n, h, S, f), each one indicating the membership of authors as the following table shows.

m Member

- a Associate
- s Student Member
- l Life Member
- n Non-member
- h Honorary Member
- S Senior Member
- f Fellow

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

No extra spaces may be added between a letter and a brace. $\{m\}$ and $\{m_{\sqcup}\}$ are regarded as different. The latter will not generate "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 can be given.

If an author does not have an affiliate, none must be specified.

 \circ You might specify e-mail address as follows.

\authorentry[TaroDenshi@iee.or.jp]

 ${\rm Taro \ Denshi}_{m}{\rm TRL}$

The following words are generated on the left side at the bottom of the first page.

"a) Correspondence to: TaroDenshi@iee.or.jp" • The \authorentry command lists the authors' names and affiliates one by one. If more than 10 authors are listed, the list occupies almost a half of the page. Therefore, if you specify as

follows, $\def = \{2\}$

then, it will list the names two per line. The argument of \authoralign must be 1 or 2.

• An author's affiliate is described in the **\affiliate** command as follows.

The first argument "label" must be the same as the 3rd argument of the $\$ authorentry command. The second argument is assigned by both the author's affiliate and address, which are separeted by $\$.

No extra spaces may be added between a letter and a brace in the first label argument. The entry of \affiliate must be followed by the order of labels in \authorlist commands.

- If the labels of affiliate are different from those of \authorentry, there will be a warning message on your terminal.
- Both the \received and \revised commands are used for the date of receipt and revision of the paper. For example, the date of receipt is assigned as \received{2011}{1}{23} and the date of revision is assigned as \revised{2011}{3}{15}.

Both commands will generate the following strings below authors' names.

"(Manuscript received January 23, 2011, revised March 15, 2011)"

• The text of the abstract is described in the abstract environment. The text should be a maximum of 150 to 200 words.

The text of the keywords is described in the keyword environment. The text should be a maximum of 6 words.

- The \maketitle command must come after those commands before the main text begins.
- The \appendix command of the standard IATEX $2_{\mathcal{E}}$ is a declaration that changes the way sectional units are numbered. But \appendix of ieej-e.cls generates the heading "Appendix" and appendix sections are numbered "1", "2", etc., appendix equation numbers are numbered "(A1)", "(A2)", etc., appendix figure numbers are numbered "app. Fig. 1", "app. Fig. 2", etc.
- The \acknowledgment command is available if you might express your gratitude.
- Authors' profile on page ?? is generated with: \begin{biography}
 - \profile{m}{Denshi Taro}{%

was born in Kumamoto, Japan,

on August 15, 1972.

- ... }
- \profile{n}{Denki Hanako}{%
- was born in Okayama, Japan,

on February 25, 1960.

... }

\end{biography}

• The first argument of the \profile command is specified by one letter out of seven letters (m, a, s, l, n, h, S) the same as the second argument of \authorentry.

The second and third arguments are filled with an author's name and profile respectively.

• If EPS (see p.3) 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 (a1.pdf when compiling with \usepackage[pdftex]{graphicx}). The \profile command automatically reads their files and puts their pictures on the left margin.

The ratio of EPS file must be width : height = 22 : 28, because EPS files are read by the following command.

 $\ensuremath{\mathsf{resizebox}}{22\mathrm{mm}}{28\mathrm{mm}}$

 $\{ \in \{a1.eps\} \}$

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

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

2.2 Type of the Letter letter option must be added as follows.

\documentclass[english,letter]{ieej-e}

An abstract should be about 100 words. Authors' profiles may be omitted.

3. Special Feature of ieej-e.cls

3.1 Formula ieej-e.cls includes dotseqn.sty in order to fill a space between a formula and a formula number with dots.

A displayed formula is aligned on the left, a fixed distance (6.5 mm) from the left margin, instead of being centered. A formula number is put on the right side, 3.25 mm from the right margin, in the equation and eqnarray environments.

The following is an example of a displayed formula. If you type below,

\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}%

then, you get the following.

A width of one column is narrow to compose displayed formulas. Therefore, you should compose equations with the proper length, paying attention to the message "Overfull \hbox".

3.2 Theorem-like Environment If you use the \newtheorem environment, pay attention to the following points. There are no additional vertical spaces before and after the environment, and the text within the environment does not appear in italics.

An example is given as follows.

\newtheorem{theorem}{Theorem}

\begin{theorem}

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 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).

3.3 Footnotes The footnote begins with "[†]" (see p.5). As the footnote counter increases, the footnote marks proceed as "[†]", "^{††}", "^{†††}". The footnote mark is set to reset at each page.

3.4 Figures and Tables The font size inside the figure and table environments is set \footnotesize (7 pt).

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] etc. for the transactions of IEEJ.

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

Here is a simple explanation to insert graphics into the text.

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

\usepackage[dvips]{graphicx}

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

 $\begin{figure}[tb]$

 $\operatorname{begin}{\operatorname{center}}$

\end{center}

 $\operatorname{caption}\{\ldots\}$

 $\left| \operatorname{label} \{ \operatorname{fig}: 1 \right\}$

\end{figure}

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

 $\[scale=0.5]{file.eps}\]$

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 30mm (with the height proportionally scaled).

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

The next is another example using **\resizebox**.

 $\operatorname{vesizebox}{30\mathrm{mm}}{!}$

 $\{ \in \{file.eps\} \}$

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

 $\noincludegraphics[width=30mm,height=40mm]$

{file.eps} or

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

Fig. 1. An example of caption in English.

Table 1. An example of table caption in English.

Α	В	С
Х	Υ	Ζ

\begin{table}[b]%[tbp] \caption{An axample of table caption in English }
\label{table:1}
\begin{center}
$\left[tabular \right] \left[c c c \right]$
\hline
A & B & C\\
\hline
X & Y & Z\\
\hline
$\end{tabular}$
\end{center}
\end{table}

 $\{ \in \{file.eps\} \}$

For further information about the graphics package, see reference book (9) (11).

3.4.2 Captions of Floating Environment The width of caption is set 72 mm (single column) and 0.8\textwidth (double column). It can be set by changing the value of \capwidth (see Fig. 1)

3.5 Verbatim Environment You can change the values of the parameters in the verbatim environment which is customized for ieej-e.cls. The default settings are:

\verbatimleftmargin=0pt

\def\verbatimsize{\normalsize}

\verbatimbaselineskip=\baselineskip

The leftmargin of the verbatim environment is set 0pt. The font size is set \normalsize. The baselineskip is set the same of normal texts.

For example, those parameters can be changed as follows:

\verbatimleftmargin=6.5mm

\def\verbatimsize{\footnotesize}

\verbatimbaselineskip=3mm

3.6 Bibliography and Citations ieej-e.cls includes the citesort.sty with a little customized. The citesort.sty collapses a list of three or more consecutive numbers into a range, and sorts the numbers before collapsing them. For example, "⁽⁶⁾ ⁽⁷⁾ ⁽⁵⁾ ⁽²⁾ ⁽¹⁾ ⁽³⁾" is transformed into "^{(1)~(3)} ^{(5)~(7)}".

The cite command displays citations as superscript numbers. To get "ref. (1)", the Cite command can be used.

In the thebibliography environment, place references in the right order according to the IEEJ editing style; e.g., authors' names, initials, title of article, journal abbreviation, volume number, pages, and publication year. Journals are italicized as \itshape, and titles of papers

Table 2.	\FRAC a	and	\RN
$\RN{2}$		I	[

enclosed with "" in plain text.

3.7 Make All Text Pages the Same Height

\flushbottom is declared in ieej-e.cls. It makes all text pages the same height, adding extra vertical space when neccessary to fill out the page.

3.8 AMS Packages The \mathcal{F}_{MS} -IATEX 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.

 $\ensuremath{\scale{scales}}\$

When the amsmath package is loaded, many environments, for example the equation, align, gather, multiline and split environments etc., will not automatically generate dots between a formula and a formula number. One primitive way to resolve this problem is to typeset as follows at the end of the formula.

 $\operatorname{Lap}(\mathrm{box \ to \ 10mm} \ EqnDots))$

This puts the leaders of width 10 mm into a box of width zero, extending to the right of the current position.

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

When the amssymb package is loaded, many extra math symbols of the \mathcal{FWS} -IATEX fonts will become available ⁽¹⁰⁾.

\usepackage[psamsfonts]{amssymb}

3.9 Miscellaneous

3.9.1 Macros Defined by ieej-e.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 cases.
- \halflineskip and \onelineskip: Produce a vertical space, 1/2\baselineskip, 1\baselineskip respectively.
- As shown in Table 2, the macros \RN and \FRAC are defined ⁽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) You should pay attention to a space after a period.

"T_EX 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 $T_{\rm FX}$ that a period doesn't end

a sentence by using a $_{\sqcup}$ 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 $T_{E}X$ that the period ends the sentence. You do this by preceding the period with a $\backslash @$ command." $^{(9)}$

Beans (lima, etc.) have vitamin $B \setminus @$.

(2) "Line breaking should be prevented at certain interword spaces. ... Trying ~(a tilde character) produces an ordinary interword space at which T_EX will never break a line." ⁽⁹⁾

Mr.~Jones, Figure~\ref{fig:1}, (1)~gnats.

- (3) 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 of a sentence, abbreviations, e.g., "in Fig. 1", "in Sect. 2", "in Eq. 3" should be used.
- (4) There should be no space after opening or before closing parentheses, as in (⊔word⊔).
- (5) 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.
- (6) 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.
- (7) The difference in the use of the hyphen (-), en dash (-) and em dash (-) should be noted. A hyphen is used in connecting English-language words such as 'well-known', and an en dash is used when expressing a range such as 'pp.298–301'. The em dash is even longer—it's used as punctuation.
- (8) The difference when hyphen and en dash are used in maths mode should also be noted. Some examples are given below. $A^{\rm br} = below.$ $A^{-c} = byphen$ $A^{-c} = byphen$ $A^{-c} = byphen$ $A^{-c} = ben dash$ $A^{b-c} = ben dash$ $A^{b-c} = ben dash$
- (9) The less-than sign "<" (<, a relation) should not be confused with "⟨" (\langle, a delimiter). The same is true for the greater-than sign ">" and "⟩".
- (10) 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, T_EX 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." ⁽⁹⁾

(11) \allowbreak may be used within long maths formulas in paragraphs instead of using \hfil\break, $\langle\rangle$ or \langle linebreak, since TEX is reluctant to break lines there.

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 + q + h + i + j + k + l + m(2)

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

"The $\backslash !$ acts like a backspace, removing the same space amount of space that $\backslash,$ adds." $^{(9)}$

 $\label{eq:alpha} $$ y=\frac{1}{2} - \frac{1}{2} - \frac{$

$$y = a + b + c + d + e + f + g + h + i + j + k + l + m \cdots \cdots (3)$$

Example 2: Using equatron environment instead of equation environment.

\begin{eqnarray}

 $\end{eqnarray}$

To typeset above, you will get the following output.

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

Example 3: To change the value of $\mbox{mathindent}$ is to change the position that the equation begins[†].

 $\end{equation}$

mathindent=6.5mm % <-- [2] default value

To typeset above (see [1]), you will get the following output.

 $y = a + b + c + d + e + f + g + h + i + j + k + l + m \cdots (5)$

The value of $\mbox{mathindent must}$ be restored (see [2]).

 $^{^\}dagger$ This explanation is appropriate to left-aligns displayed formulas, not to centering formulas.

Example 4:

$$\iint_{S} \left(\frac{\partial V}{\partial x} - \frac{\partial U}{\partial y} \right) dx dy = \oint_{C} \left(U \frac{dx}{ds} + V \frac{dy}{ds} \right) ds \cdots (6)$$

The equation is too long and 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

 $\left(eqnarray \right)$

To typeset above, you will get the following output.

Example 5: A matrix using the array environment.

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

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

\end{equation}

The \arraycolsep dimension is half the width of a horizontal space between columns in the array environment. A matrix using the array environment can be shrunk by changing the value of \arraycolsep (see [1]). And also it can be shrunk by using @-expression (see [2]).

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

Compare Eqs. (8) and (9).

Example 6: A matrix using a \pmatrix.

 $\begin{equation}$

 $\label{eq:add} $$ \eqref{eq:add} $$ \eqref{eq:$

 $\end{equation}$

In the case of the equation using \pmatrix, the definition of \quad can be changed (see [1]).

If amsmath packages is loaded, the pmatrix environment (\begin{pmatrix} and \end{pmatrix}) must be selected instead of \pmatrix. In that case the explanation on Example 5 is useful.

References

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Appendix

1. Printing on A4 paper and making pdf file

- If you print a manuscript on A4 paper by using dvips printer driver, the following parameter might be set. dvips -Pprinter -t a4 -O 0in,0in file.dvi printer is a name of printer. "-t a4 -O 0in,0in" option might be omitted.
- You can directly make a pdf file by using pdflatex, or convert a dvi file to a pdf file by using dvips and Acrobat Distiller or dvipdfmx.
- If you convert a dvi file to a pdf file, you must first convert a dvi file to a ps file (printer is your printer name):
 - dvips -Pprinter -t a4 -O 0in,0in

-o file.ps file.dvi

"-t a4 -O 0in,0in" option might be omitted. Then, convert a ps file to pdf file by using Acrobat Distiller.

Otherwise, you may convert a dvi file to a pdf file by using dvipdfmx.

dvipdfmx -p a4 -x 1in -y 1in

-o file.pdf file.dvi

"-p a4 -x 1in -y 1in" option might be omitted.

2. Omitted Commands

Some commands which is not required by ieej-e.cls

are omitted. These commands are **\tableof** contents, **\titlepage**, **\part**, **\theindex**, headings, myheadings and the related commands.