Analsis de un rectifacdor de media onda con carga RL

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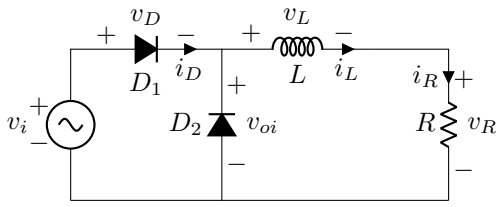
***Abstract*—This document is a model and instructions for LaTeX. This and the IEEEtran.cls file define the components of your document [title, text, heads, etc.]. *CRITICAL: Do Not Use Symbols, Special Characters, Footnotes, or Math in Document title or Abstract.**

I. Introduction

This document is a model and instructions for LaTeX. Please observe the report page limits.



II. Análisis del rectificador monofásico de media onda con carga $R-L$ y diodo de corrida libre

En lo que sigue consideramos la fuente sinusoidal

$$v_i(t) = V_m \sin(\omega t),$$

una impedancia serie R y L (carga), y dos diodos ideales:

- D_1: rectificador que conecta la fuente a la carga (ánodo en la fuente, cátodo en el nodo de carga).
- D_2: diodo de *flyback* en paralelo a la carga (orientación tal que permite mantener la corriente inductiva cuando la fuente deja de alimentar).

A. Estados asumidos de los diodos

Definición de los 4 estados considerados y denotamos ON como conducción (diodo polarizado directamente) y OFF como bloqueo (polarizado inversamente).

$$\begin{aligned}
&\text{Estado A:} \quad (D_1 = \text{ON},\ D_2 = \text{OFF}) \\
&\text{Estado B:} \quad (D_1 = \text{OFF},\ D_2 = \text{ON}) \\
&\text{Estado C:} \quad (D_1 = \text{OFF},\ D_2 = \text{OFF}) \\
&\text{Estado D:} \quad (D_1 = \text{ON},\ D_2 = \text{ON})
\end{aligned}$$

- **Operación de cada estado asumido :**
  1) Estado A: Ocurre cuando la tensión instantánea de la fuente tiende a *polarizar positivamente* D_1 y puede imponer una tensión mayor en el nodo de carga que la necesaria para forzar D_2 en conducción inversa. D_1 conduce si $v_i(t) > v_R(t)$ (ánodo de D_1 más positivo que su cátodo). En la práctica, con diodos ideales y caída nula, el encendido ocurre cuando $v_i(t)$ supera la tensión instantánea necesaria para mantener la corriente $i(t) > 0$.
  2) Estado B: Ocurre cuando la fuente no sostiene la corriente inductiva, pero la inercia del inductor mantiene corriente positiva; entonces D_2 ofrece el camino de libre. D_2 conduce si la polaridad en la carga, hace que el ánodo de D_2 sea más positivo que su cátodo, es decir, cuando la inercia del inductor empuja la corriente y la tensión en la carga favorece la conducción por D_2. Con la orientación antiparalela típica, esto sucede cuando $v_i(t)$ cae por debajo de $v_o(t)$ y la corriente inductiva es positiva.
  3) Estado C: Estado de no-conducción es válido si la corriente ha decaído a cero ($i(t) = 0$) y ambas tensiones en los ánodos/cátodos de los diodos dejan a ambos inversamente polarizados.
  4) Estado D: Si los diodos son ideales y están orientados en la configuración habitual (antiparalelo para D_2), la conducción simultánea tiende a producir una contradicción en las polaridades o a generar un lazo de circulación que, en el mejor de los casos, fuerza igualar tensiones entre nodos y, en el peor, crea una trayectoria de cortocircuito entre la fuente y el retorno. Por tanto en la práctica se considera no-sostenible como estado permanente y debe justificarse con cuidado.

B. Modelo en espacio de estados de los estados válidos

En este sistema la única variable de estado es la corriente $i(t)$ de la carga $R-L$. Usaremos la variable de estado:

$$x(t) = i(t).$$

A continuación planteamos las ecuaciones de estado para cada configuración válida (y para la configuración asumida D).

a) Estado A: $D_1 = \text{ON},\ D_2 = \text{OFF}$ (circuito L–R con fuente de alimentación).: La ecuación diferencial y la representación en espacio de estados:

$$L\frac{di}{dt} + R\,i(t) = v_s(t) = V_m \sin(\omega t).$$

$$\left[\dot{x}(t)\right] = \left[-\frac{R}{L}\right]\left[x(t)\right] + \left[\frac{1}{L}\right] \qquad y(t) = \left[R\right]\left[x(t)\right].$$

Solución general (en t_0 con condición $i(t_0) = I_0$):

$$i(t) = e^{-\frac{R}{L}(t-t_0)} I_0 + \frac{V_m}{L}\int_{t_0}^{t} e^{-\frac{R}{L}(t-\tau)} \sin(\omega\tau)\, d\tau.$$

La parte forzada en régimen permanente (cuando el tiempo es mucho mayor que $\frac{L}{R}$) tiene la forma:

$$i_p(t) = \frac{V_m}{\sqrt{R^2 + (\omega L)^2}} \sin(\omega t - \phi), \qquad \phi = \arctan\frac{\omega L}{R}.$$

b) Estado B: (diodo flyback *— circuito L–R sin fuente).:* Ecuación diferencial:

$$L\frac{di}{dt} + R\,i(t) = 0$$

$$\left[\dot{x}(t)\right] = \left[-\frac{R}{L}\right]\left[x(t)\right] \qquad y(t) = \left[R\right]\left[x(t)\right].$$

La solucion general es:

$$i(t) = I_1\, e^{-\frac{R}{L}(t-t_1)},$$

donde I_1 es la corriente en el instante t_1 en que comienza el freewheeling.

c) Estado C: (no-conducción).: Si $x(t) = i(t) = 0$ este estado es consistente; la dinámica es $i \equiv 0$. Si el inductor intenta imponer $i \neq 0$.

III. Ease of Use

A. Maintaining the Integrity of the Specifications

The IEEEtran class file is used to format your document and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin measures proportionately more than is customary. This measurement and others are deliberate, please do not revise any of the current designations.

B. Subsection Heading Here

Subsection text here.

IV. Prepare Your Document Before Styling

Before you begin to format your document, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections IV-A–IV-E below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not number text heads—LaTeX will do that for you.

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive".
- Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
- Do not mix complete spellings and abbreviations of units: "Wb/m^2" or "webers per square meter", not "webers/m^2". Spell out units when they appear in text: ". . . a few henries", not ". . . a few H".
- Use a zero before decimal points: "0.25", not ".25". Use "cm^3", not "cc".)

C. Equations

Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a + b = \gamma. \tag{1}$$

Be sure that the symbols in your equation have been defined before or immediately following the equation. Use "(1)", not "Eq. (1)" or "equation (1)", except at the beginning of a sentence: "Equation (1) is . . ."

D. LaTeX-Specific Advice

Please use "soft" (e.g., `\eqref{Eq}`) cross references instead of "hard" references (e.g., `(1)`). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don't use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

Please note that the `{subequations}` environment in LaTeX will increment the main equation counter even when there are no equation numbers displayed. If you forget that, you might write a document in which the equation numbers skip from (17) to (20), causing the reader to wonder if you've discovered a new method of counting.

BIBTEX does not work by magic. It doesn't get the bibliographic data from thin air but from .bib files. If you use BIBTEX to produce a bibliography you must include the .bib files.

LATEX can't read your mind. If you assign the same label to a subsubsection and a table, you might find that Table I has been cross referenced as Table IV-B3.

LATEX does not have precognitive abilities. If you put a `\label` command before the command that updates the counter it's supposed to be using, the label will pick up the last counter to be cross referenced instead. In particular, a `\label` command should not go before the caption of a figure or a table.

Do not use `\nonumber` inside the `{array}` environment. It will not stop equation numbers inside `{array}` (there won't be any anyway) and it might stop a wanted equation number in the surrounding equation.

E. Some Common Mistakes

- The word "data" is plural, not singular.
- The subscript for the permeability of vacuum μ_0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter "o".
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
- A graph within a graph is an "inset", not an "insert". The word alternatively is preferred to the word "alternately" (unless you really mean something that alternates).
- Do not use the word "essentially" to mean "approximately" or "effectively".
- In your document title, if the words "that uses" can accurately replace the word "using", capitalize the "u"; if not, keep using lower-cased.
- Be aware of the different meanings of the homophones "affect" and "effect", "complement" and "compliment", "discreet" and "discrete", "principal" and "principle".
- Do not confuse "imply" and "infer".
- The prefix "non" is not a word; it should be joined to the word it modifies, usually without a hyphen.
- There is no period after the "et" in the Latin abbreviation "et al.".
- The abbreviation "i.e." means "that is", and the abbreviation "e.g." means "for example".

An excellent style manual for science writers is [7].

F. Authors and Affiliations

The class file is designed for, but not limited to, six authors. A minimum of one author is required. Author names should be listed starting from left to right and then moving down to the next line. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

G. Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your document. There are two types: component heads and text heads.

Component heads identify the different components of your document and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the document title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced.

H. Figures and Tables

a) Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation "Fig. 1", even at the beginning of a sentence.

TABLE I
TABLE TYPE STYLES

Table Head	**Table Column Head**		
	Table column subhead	***Subhead***	***Subhead***
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[a]Sample of a Table footnote.

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity "Magnetization", or "Magnetization, M", not just "M". If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write "Magnetization (A/m)" or "Magnetization {A[m(1)]}", not just "A/m". Do not label axes with a ratio of quantities and units. For example, write "Temperature (K)", not "Temperature/K".

REFERENCES

Please number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply

Fig. 1. Example of a figure caption.

to the reference number, as in [3]—do not use "Ref. [3]" or "reference [3]" except at the beginning of a sentence: "Reference [3] was the first ..."

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors' names; do not use "et al.". Papers that have not been published, even if they have been submitted for publication, should be cited as "unpublished" [4]. Papers that have been accepted for publication should be cited as "in press" [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

V. Conclusions

The conclusion goes here.

References

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[3] I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[4] K. Elissa, "Title of paper if known," unpublished.

[5] R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interf ace," IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].

[7] M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

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