University of Manitoba

HVDC Transmission I

Assignment 1

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Problem 1: Mathematical expressions

The Fourier transform of the signal $x(t)$ is defined as

$$X(f) = \int_{-\infty}^{\infty} x(t) e^{-j2\pi ft} \, \mathrm{d}t \tag{1}$$

where $X(f)$ is the spectrum of the signal at frequency f. The time domain expression can then be reproduced by synthesizing all frequency content through inverse Fourier transform as follows.

$$x(t) = \int_{-\infty}^{\infty} X(f) e^{j2\pi ft} \, \mathrm{d}f \tag{2}$$

By taking the derivative of the equation (2) with respect to the time t, one can prove the derivative property of the Fourier transform as

$$\frac{\mathrm{d}x}{\mathrm{d}t} \quad \rightarrow \quad (j2\pi f)X(f) \tag{3}$$

Problem 2: How to include table?

Table 1: Characteristics of the buck converter

Input Voltage (V)	Output Voltage (V)	Calculated Duty Cycle
40	20	0.5
50	20	0.5
80	20	0.25

Problem 3: How to include graphics?

Images, figures, and photos are usually included in the context using the command `includegraphics` inside `figure` environment.

```
\begin{figure}[H]
    \centering
    \includegraphics[options]{filename}
    \caption{caption for the figure}
    \label{fig: figlabel}
\end{figure}
```

Figure 1 shows some elements that are frequently used in power electronic converters. This figure is adopted from [1].

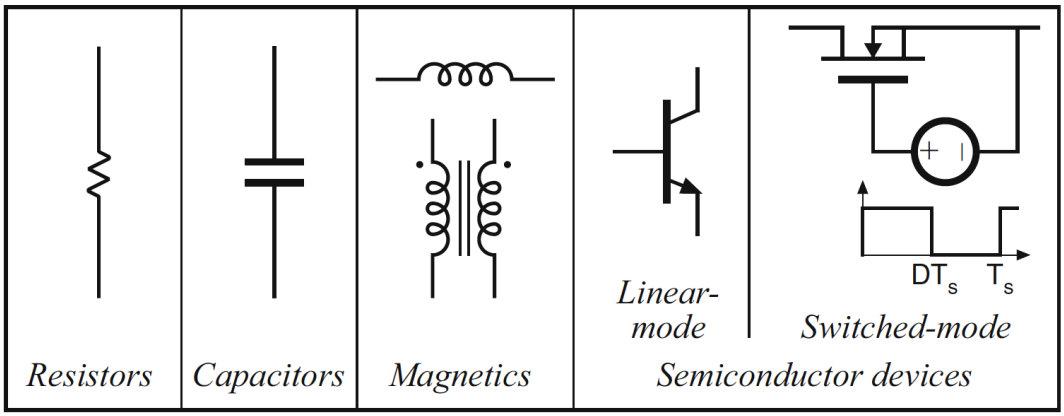

Figure 1: Elements of power electronic converters

For more information on how to use this package, please visit the following website:
https://latexref.xyz/_005cincludegraphics.html

1 Problem 4: How to cite?

Paper [2] provides guidelines for modeling power electronics in electric power engineering application. If you do not include any reference please delete the reference section at the end of the document (see three lines of code before `\end{document}`)

References

[1] R. W. Erickson and D. Maksimović, *Fundamentals of Power Electronics*. Springer Cham, 2020.

[2] A. Gole, A. Keri, C. Kwankpa, E. Gunther, H. Dommel, I. Hassan, J. Marti, J. Martinez, K. Fehrle, L. Tang, M. McGranaghan, O. Nayak, P. Ribeiro, R. Iravani, and R. Lasseter, "Guidelines for modeling power electronics in electric power engineering applications," *IEEE Transactions on Power Delivery*, vol. 12, no. 1, pp. 505–514, 1997.