ACKNOWLEDGEMENT

The author is duty bound to express his deep sense of indebtedness to his supervisor and mentor, Dr. P. Dananjayan, Professor, Department of Electronics and Communication Engineering, for his support, motivation and encouragement right from the inception till the successful completion of this dissertation.

The author acknowledges the help rendered, discussions and suggestions extended by Mr. M. Ramaswamy, during the course of writing this thesis. He owes his gratitude to Mr. R. Vijayarajeshwaran, Managing Director, Vi Micro systems Pvt. Ltd, Chennai, for his continuous support and timely help in providing necessary components for constructing the proto-type models.

The author wishes to thank his students Mr. R. Mathavan, Mr. S. Venkatesan, Mr. A. Ilayaraja, Mr. G. Pavan kumar, Mr. R. Nandha kumar and Mr. L. Manikanda Prabu for their help and support.

The author thanks Dr. A. Muthuramalingam, Assistant Professor, Department of Electrical and Electronics Engineering, for allowing him to use the TAPTEC facilities for his research. The author profusely thanks Dr. R. Gnanadass, Assistant Professor, Department of Electrical and Electronics Engineering for inducing him to embark on this programme and helping him in the formative stage. The author wishes to place on record the help extended by Mr. P. Muralidassan, Assistant Registrar, Pondicherry University.

The author wishes to express his thanks to Dr. K. Manivannan, Professor, Department of Electrical and Electronics Engineering, for the support and suggestions at every stage. He is grateful to Dr. T. G. Palanivelu, Principal, Pondicherry Engineering College for permitting him to use the facilities in the college for carrying out the research work.

The author would not have been able to complete his work, but for the blessings of his father Mr. S. Seenithangam.

S. JEEVANANTHAN

iii
ABSTRACT

The field of power electronics has recently experienced unprecedented growth. Its applications have rapidly expanded to cover many sectors of our society. This surge is due to several factors; paramount among them being the technological advancements made by the semiconductor device industry, which has led to the introduction of high speed and high power integrated devices. The other factors include (i) the advances in the area of microelectronics that have paved the way for the development of efficient integrated circuits and the growth of processors, (ii) the ever mounting need for smaller size and lighter weight power electronic circuits, and (iii) the rising demand for sophisticated power electronic gadgets. This increasing reliance on power converters has made it mandatory that all such systems should have lower harmonic content, improved input power factor, minimum total harmonic distortion (THD) and electromagnetic interference (EMI) limited within the regulated range.

The performance of a converter with a modulation strategy can be related to the harmonic content of the output voltages. It is therefore important to take a closer look at the harmonic content in the input and/or output waveforms. The most widely used measure to quantify the harmonics present in the output of converters is the THD. The other indices that the converter system needs to cater to are the distortion factor and the input power factor.

There is a need to control the power converters so as to guarantee the desired voltages in the appropriate frequency range. The design of control strategies will have to be efficient and effective to enable the converters to realise the dictated performance.

It is in this perspective that newer control strategies are proposed to enhance the performance of power electronic converters in general, ac output converters in particular. Besides efforts are aimed to modify the existing techniques in a direction that will assist the power modulators to effectively meet the requirements of power utilities. The algorithms are designed to be tailor made to enable the loads to exploit the available power, with acceptable detriments to power quality.