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**OPTIMIZATION PARAMETERS OF
INTEGRATED BUCK-FORWARD CONVERTER
ON MINIMIZING RIPPLE FACTOR**

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

For modern electronics, where efficiency and compactness are critical, power converter design and optimization are important. By designing an integrated buck-forward converter, this research aims to reduce ripple factors and increase power system efficiency. Performance is improved by the converter's simple layout and less components, which combine the benefits of forward and buck topologies. MATLAB Simulink was used to simulate the circuit and analyze performance characteristics in multiple scenarios. The two optimization methods that were used were Particle Swarm Optimization (PSO) and the brute force method. Through careful examination of various inductor and capacitor parameter combinations, the brute force method produced a comprehensive solution. Since PSO was based on particle social behaviour, it offered a faster and more efficient method of achieving the best results. The study showed that PSO beat brute force in terms of computation efficiency and convergence speed with careful parameter adjustments, achieving minimal ripple factors. According to the findings, the integrated buck-forward converter's components can be changed to successfully manage power in a range of applications. In this study, optimization methodologies for integrated power converters are advanced by providing recommendations for designing high-efficiency devices with low ripple factors. The findings demonstrate the potential of artificial intelligence-driven methods like PSO in modern power electronics, creating opportunities for additional developments in converter design and optimization.

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TABLE OF CONTENTS

	PAGE
AUTHOR'S DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES	vii
LIST OF APPENDICES	viii
LIST OF SYMBOLS	ix
LIST OF ABBREVIATIONS	x
CHAPTER 1 INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Objectives	2
1.4 Significance of Study	3
1.5 Scope/limitation of the project	4
1.6 Outline of the thesis	4
CHAPTER 2 LITERATURE REVIEW	6
2.1 Introduction	6
2.2 Buck and forward topologies	7
2.2.1 Buck Converter	7
2.2.2 Forward Converters	8
2.2.3 Integrated Buck-Forward converter	9
2.3 Optimization techniques in integrated dc-dc converter	12
2.3.1 Derivation of the Buck-forward Converter	12
2.3.2 Brute force Optimization method	12
2.3.3 Artificial Intelligence (AI) Techniques	13
2.3.4 Comparison Between PSO and GA	14