COMPUTATION OF END-WINDING INDUCTANCE OF RELUCTANCE MACHINES

Project report is presented in partial of fulfillment for the award of the

Bachelor of Electrical Engineering (Hons)

UNIVERSITI TEKNOLOGI MARA

MALAYSIA

ANUAR BIN IBRAHIM

Faculty of Electrical Engineering

UNIVERSITI TEKNOLOGI MARA

40450 SHAH ALAM, SELANGOR

ACKNOWLEDGEMENT

In the name of ALLAH

Most Gracious and Most Merciful

It is with the deepest sense of the Al-Mighty ALLAH that gives me the strength, good health and ability to complete this project. All good aspirations, devotions and prayers are due to ALLAH whose blessing and guidance have helped me all over the entire project.

I would like to express my heartfelt and appreciation to my supervisor's Assoc. Prof. Dr. Chan Sei for his concern, valuable time of consultation and advice, guidance, patience and constant encouragement in supervising my project from the beginning until the completion of the thesis, and all of that will be remember in my life.

Special thanks to my beloved family, especially to my mother and father who are dearest person in my life and greatest source of inspiration, give the moral and supports during the completion of this course and thesis.

Last but not least, I wish to express my earnest thanks to my friends for the valuable help and motivation given in completing this project.

Hopefully, with all the help and supports which give from the above mentioned will be reciprocated by the ALLAH.

Thank you.

ABSTRACT

The inductance of an electrical machine is hard to be calculated. Nowadays, advancement in finite-element analysis and computer hardware has allowed the calculation of the end-winding inductance of electrical machines or Switched-Reluctance Motor (SRM) more easily. Therefore, this paper introduces a computation of end-winding leakage inductance of electrical machines due to the effect in the end winding itself by using Finite Element Method Magnetics. It is based on a 2D geometric model of the end winding region. The main objective of this paper is to obtain the general empirical curves or equations by means of finite element analysis with the FEMM software.

Keyword: Finite Element Method Magnetics, End Windings, Inductance

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Machines are the important system in the world. Since the machines became a widely used in the world so based on that various types of machines have been created one of it are Switched Reluctance Machines (SRM). SRM are receiving significant attention from industries in the last decade because of the advantages it possesses. They are extremely inexpensive, reliable and weigh less than other machines of comparable outputs power. Although the design principles of the machine are available as a concatenation of many different sources, the need for a combined, step-by-step design procedure from first principles of electromagnetic is an absolute requirement [1]. The winding ends of the rotating electrical machines have leakage field (when flowed by currents) and corresponding leakage inductance. The performances of an electric machine are given by the parameters corresponding to the equivalent electric scheme. For example, the behavior and the performances of an AC machine depend on the total leakage inductance, but this is determined in the design phase as a sum of the inductances corresponding to the leakage flux in different portions of the machine. The numerical analysis based on the finite elements method (FEM) is probably, at present, one of the best instruments regarding the precision of the obtained results, having the great advantage that it can already be executed in the phase of its design/optimizing [2]. SRM is generally believed to demonstrate good potential in power density, torque/inertia ratio,