IMPLEMENTATION OF COSMOS/M SOFTWARE IN SOLVING ELECTROMAGNETIC FIELD PROBLEMS I

Thesis presented in partial fulfilment for the award of the
Advanced Diploma in Electrical Engineering of
INSTITUT TEKNOLOGI MARA

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JUNE 1995

ABSTRACT

This project concerns with using one of the most recent softwares, namely Cosmos/M. Cosmos/M is designed to solve the problems in the area of electromagnetics in addition to fluid, fatigue, crash, steady state and transient thermal analysis and many more in engineering field. The program is based on finite element method which can operates such as geometry creation, meshing, applying loads and boundary conditions, defining material and section properties, performing the analysis and postprocessing of analysis results.

ACKNOWLEDGEMENTS

In preparing this thesis, I received help from many people, directly or indirectly. First, I would like to express my sincere gratitude to the Department of Electrical Engineering, on behalf of MARA Institute of Technology for their concern and support in my project management.

I am very grateful to my project supervisor, Dr. Nabil Mahmoud Abdul Kadir for his technical advice and enthusiasm without which this project would not have been possible. My appreciation also goes out to all the lecturers whose teachings and encouragement have always been valuable and unforgettable.

Last but not least, I would like to thank my partner in this final year project, Mr.Azlan Hussin for his cooperation in completing the project. My thanks also to all my classmates for their kindness and friendship. Among them, Mr. Shaharudeen Yunos, Mr. Mohd. Nor Separi and Miss Umi Salmah bt. Mihad deserve special mention. Finally, I wish to thank my family for their understanding and support.

Mohamad Zulkefli Adam
May, '95

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INTRODUCTION

The basic theory of the electric and magnetic fields deserves subsequent attention in the most electrical engineering curriculum although the curricula begin with a study of electric circuits. The familiarity with circuit concepts as well as a knowledge of calculus allows a treatment of field theory that proceeds through Maxwell's equations and justifies the approximation leading to circuit theory. In electromagnetics, Maxwell's equations are the central theme. These equations are developed from the historical appproach in which the relevant experimental laws are gradually introduced and manipulated with the help of a steadily increasing knowledge of vector calculus. Several applications of these equations are wave motion, skin effect, transmission line phenomena, circuit theory and the resonant cavity [1].

Vector analysis is the first step in learning electromagnetics where carrying this elementary work a bit further will soon lead to line-filling equations often composed of terms which all look the same. It is a mathematical shorthand and considered as an integral part of the subject. Thus, the terms scalars and vectors, vector algebra, cartesian *coordinate system, vector components and unit vectors, the vector field, dot and cross* product and other coordinate systems forms the basic knowledge of electromagnetics. When implementing this software, the knowledge of basic principles of electricity should be enhanced. The Ohm's, Gauss's, Coulomb's, Faraday's, Ampere's, Biot-Savart's, Kirchoff's equations and laws were developed and formulated in order to solved a number of electromagnetics problems. The entire field of electromagnetics theory is then open to us and the usage of Maxwell's equations to describe wave propagation, radiation from antennas, skin effect, waveguides and transmission lines and travelling wave tubes and even to obtain a new insight into the ordinary power transformer [2]. After drawing a few of the fields as above, the concept of electric flux and electric flux density are invented, which streams away symmetrically from a point charge and is coincident with the streamlines and to visualise this flux wherever an electric field is present. Michael Faraday, a scientist conducted a test and found that the total charge on the outer sphere was equal in magnitude to the original charge place on the inner sphere regardless of dielectric material separating the two spheres. There was some sort of displacement from